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INCLUSIVE GROWTH: BASICS, INDICATORS AND DEVELOPMENT PRIORITIES

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INTRODUCTION

Nowadays, the development of the national economy and society, the problem regarding radical reformation of socio-economic relations is not only an issue of economic growth but also a question of the ability to form the preconditions in the strategic perspective to achieve the living standards already adopted in the developed countries. The legitimacy of the reforms means to form a new institutional structure that has to take into account national specificities, on the one hand, and, to be in line with the European context on the other hand. Today, global development priorities are far broader than GDP growth. Global goals are being shifted to a social plane where welfare, social standards, environmental peculiarities of production and consumption are the determinants that define the principles, procedures and instruments of public policy.

Therefore, the international community and most states recognize the necessity to study and to develop approaches to improve the current model of economic growth. The issue of the growth-oriented economic policies effectiveness requires to be rethought to solve inequalities in all its manifestations: economic, social, gender, inequalities in access to resources, representation in government, etc. Thus, it is important to include non-economic targets - measuring instruments, the analysis of which will ensure the national economy effectiveness.

The experience of most countries shows that the transformation of the national economy at the present stage cannot be limited only by the change of regulatory institutions. It is important to form the theoretical and methodological basis for state regulation of changes occurring in different spheres of public life in the context of achieving inclusive growth.

The paper presents the theoretical principles to ensure inclusive growth of the country, as well as analyzes the

scientists' existing heritage in the study of this issue. Based on the methodology to assess the integral indices for every spheres of public life (economic, political, social), the approach to evaluating the effectiveness of the measures taken for state regulation of the national economy is grounded.

Counteraction to money laundering and shadow processes plays an important role in inclusive growth. The monograph presents the methodology of causal research links between the level of shadowing of the national economy and the determinants of the country's social development. Besides this, authors have proposed an approach for assessing the level of effective financial monitoring. Emphasis is placed on the role of environmental taxes, which are less of a burden on the economy than taxes on wages or income taxes.

The monograph was performed within the framework of the research themes «Modeling and forecasting the socio-economic and political roadmap for reform in Ukraine to move to a sustainable growth model» (0118U003569), «The reforming of lifelong learning system in Ukraine for the prevention of the labour migration: the coopetition model of the institutional partnership» (0120U102001), «Econometric modeling of the shadow capital outflow schemes through tax and investment channels in Ukraine» (10117U003930), «Structure-functional multiplicative model of development of the system of environmental taxes in Ukraine in the context of providing national security"» (0119U100759), «Cybersecurity in the fight against banking fraud: protection of consumers of financial services and growth of financial and economic security of Ukraine» (0118U003574) which are financed by the State budget of Ukraine.

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1. THE INCLUSIVE GROWTH CONCEPTION: SEARCHING FOR COMPROMISE SOLUTION OF DEVELOPMENT

1.1. The theoretical basis of the inclusive growth concept

The inclusive economic growth as a task of the government regulation policy is now the main issue of studies and political debates in many countries and international organizations (Organization for Economic Cooperation and Development (OECD), United Nations Development Program (UNDP), International Monetary Fund (IMF), World Bank Group, etc.). in particular, possibilities of its achievement for economies with different levels of development are being discussed.

As Karimova A. (2018) notes, the inclusive development concept is the core of the institutional development policy hypothesis that integrates social innovation with the tools of the neoclassical economy. This concept is based on the inclusive institution theory, which combines centralization (state regulation) and institutional pluralism (effective representation of the interests of each group in society).

According to Karimova A. (2018), the important aspects of this conception include a rethinking of the state role in the economic development and growth processes, which are shown in the following theses:

- sustainable development is impossible without an effective state;
- state and market functions complement but do not replace each other;
- the effectiveness of government regulation is the result of the efforts of the market, civil society and the government;

– poverty reduction requires effective economic policies, including the promotion of macroeconomic stability, well-developed human capital and openness to the world economy.

The analysis of scientific publications and analytical materials indicates the fact that there is no common understanding of the inclusive growth, both within the scientific community and in the field of international organizations, which are developing proposals for inclusive growth.

Ianchovichin E. and Lundstrom S., 2016. define inclusive growth as a steady growth at a rapid pace, affecting all sectors of the economy and involving large parts of the country's labour force, characterized by equal access to the labour market and resources.

The specific nature of some organizations causes the focus on certain narrow aspects of inclusive growth, in particular, the Federal Deposit Insurance Corporation defines an inclusive economy as a complex of efforts of the state and the private sector aimed at attracting consumers to the financial environment. It means that only one accessibility aspect is considered - the availability of financial resources.

Anand, R. et al. (2013) consider inclusive growth from the standpoint of pace and structure of economic growth as interrelated features that are assessed together. The World Bank focuses on growth rates (economic growth rates) as they are seen as a source of absolute poverty reduction. However, the following components are extremely important;

– productivity that can contribute to wage growth and reduce economic inequality;
– equal access to markets and resources;
– effective regulation, which should be aimed at creating an enabling environment for business and household.

Together with these components, the broad coverage of spheres and sectors of the national economy is seen as a factor of this growth sustainability over a long period.

The Asian Development Bank, ABD (2018) has identified inclusive growth as a concept that goes beyond growth in its traditional sense and has a broad framework at its core. It is a growth that creates not only new economic opportunities but also provides equal access to opportunities created for all social classes, especially poor people. It means that income growth is not recognized as a desirable outcome, but is considered inclusive if:

- it lets participation of all members of society, particularly, the least protected sections of the population (the "non-discriminatory" aspect of growth),
- it is accompanied by a reduction of the inequality in the so-called non-profit dimensions of welfare, which are especially important for expanding economic opportunities (education, health care, social integration).

UNDP (2013) considers inclusive growth both as a result and as a process at the same time. The process vision means that everyone can participate in the growth process, both in terms of decision making and in terms of their own participation. The resultant view of inclusive growth implies that it has a measurable outcome that is common.

The importance of this concept in UNDP's activity is evidenced by the renaming of the International Poverty Law Center, established in Brazil to the International Center for Inclusive Growth Policy, which is based on the precondition that more equal communities have better development outcomes.

Inclusive growth in the EUROPE (2020) strategy means high employment of the population with economic, social and territorial cohesion through improving the employment quality in Europe, increasing better jobs for different social groups (women, young people, older people); helping people of all ages manage change through learning by investing; modernization of the labour market and social security systems; dissemination of growth results.

The project “Sustainable Development Strategies of Ukraine 2030” defines that inclusive development is economic growth that creates maximum opportunities for employment and participation in all spheres of life in the country for all social classes, as well as ensures a fair distribution of labour results.

In accordance with its objectives, the National Bank of Ukraine (2019) has identified financial inclusion importance as one of its strategic goals. Financial Inclusion is a formation of the conditions to involve all social classes and business to use the various financial services that are affordable in terms of infrastructure and price, are formally regulated and meet the needs of the population in order to stimulate the country’s economic growth and to reduce social inequality in society.

The OECD's International Financial Education Network (OECD 2014a) defines financial inclusion as the process to promote accessible, timely and full access to a wide range of financial products and services, disseminating them to all social classes through the implementation of traditional and innovative approaches, including financial literacy and education to promote both financial well-being and economic and social inclusion.

Let us focus more on the approach of Organization for Economic Co-operation and Development to understanding the essence and components of inclusive growth. Based on the generalization of OCD sources (2014b, 2016a, 2016c), the main features of inclusive growth as a prerequisite to forming a regulatory impact on the national economy can be considered:

1. Reduction of economic inequality due to income disparities that have increased in many countries since the post-crisis period of 2008-2009.

2. Income- and consumption-based indices do not represent the welfare growth in its broadest sense.

3. Income inequality should be analyzed in conjunction with inequalities in access to quality education, health care, etc.

Therefore, economic growth measures should be expanded and focused not on average incomes but on specific social groups and regions and should take into account social outcomes.

4. Introduction of subjective assessments (subjective perceptions of people's life satisfaction, happiness index, etc.) as indices of assessing the countries' economic development.

The policy of promoting economic growth should be oriented to increase the population's welfare, and the resulting resources should be used to achieve social goals and ensure growth over the long term.

The need to improve existing and new institutions as a condition for improving the efficiency and long-term potential of national economies is currently emphasized, taking into account the specific needs and capabilities of the country. The current approaches summarizing to identifying key aspects of the analysis regulation that should be based on inclusive growth has highlighted the following key:

Non-profit measures are essential for economic decisions since they significantly affect the citizens' employment opportunities, their integration into the labour market, and financial benefits. That is why non-profit measures are seen as growth factors that can improve the citizens' financial position and the economic performance of the economy as a whole. These factors demonstrate a multidimensional vision of inclusive growth, which calls for a revision of traditional measures and factors for the effective economy. An analysis of current research indicates that there is an active debate on the importance of subjective factors for decision-making in the state's economic policy regarding social sector regulation. In particular, the Organization for Economic Cooperation and Development (OECD, 2014b) recommends considering the following procedural components of government regulation for inclusive growth:

– multidimensional analysis characterizing welfare and social outcomes;
– income redistribution mechanisms aimed at reducing inequalities;
– identification of areas and sectors of the national economy the reforming of which will provide inclusive growth.

Traditionally, the list of non-profit drivers of growth and welfare is viewed in a broad context (education, health, environmental quality, individual subjective welfare assessments, social ties, personal safety, etc.) (OECD (2014b)). The experts mention that the quality and living standards, estimated in the multidimensional plane, has been improved faster than GDP per capita despite widening income inequality) (OECD, 2018a). The multidimensional living standard can be used as additional to GDP per capita in assessing the government regulation effectiveness of the institutional quality in the social sector of the national economy.

The estimates show that a one percentage point reduction in unemployment is equivalent to a 2% increase in household income, and a one-year extension of life adds 5% to the OECD household budget (2015d: 25) /

Today, the inclusive growth issue is paid much attention, since equality of opportunity, expressed in traditional economic indices of health or well-being, is more important than economic results since the lack of that equality adversely affects the economic outcomes of growth and well-being. Given the fact that the opportunities which form the base for the needs of the population are provided by the development of institutions, it is necessary to define the guidelines for the development of social sector institutions in the national economy by targeted economic policy guidelines.

In the scope of this work, exploring non-profit (social) measures of inclusive growth, we will consider the major ones, the impact of which is recognized as the largest, as confirmed by

a number of current studies. In particular, education, health care, social protection, and social capital for assessing social engagement the impact of which on the economic growth has also been proved by a number of empirical studies.

The objectives of this study are to form the analytical and theoretical basis to develop a recommendation regarding the formation of a state regulation strategy for institutional changes in the social sector of the national economy. The analytical framework will be formed to include a broad list of growth indices and social measure units of welfare in the decision-making process. This approach lets us assess the impact on the policy of regulating the various social and economic determinants. The conceptual vision of the tasks currently facing the governments of many countries and the solving of which will be demonstrated in the study are set out in Figure 1.1.

Undoubtedly, indices of the unemployment, longevity, availability of resources, first and foremost financial, are important components of the decisions that should be included in the decision-making process for ensuring economic growth, but it is quite difficult to cover all social (non-profit) determinants of inclusive growth within one study.

Researchers who study inclusive growth emphasize the lack of assessments, and there is a necessity to ensure inclusive growth in the face of governments' economic policies Ramos, R., and Almeida R. (2013). GDP per capita and average household incomes have traditionally been similar for long periods. However, the specific structural policies of economic growth in different countries have different impacts on GDP per capita and real income, including differences observed across social groups.

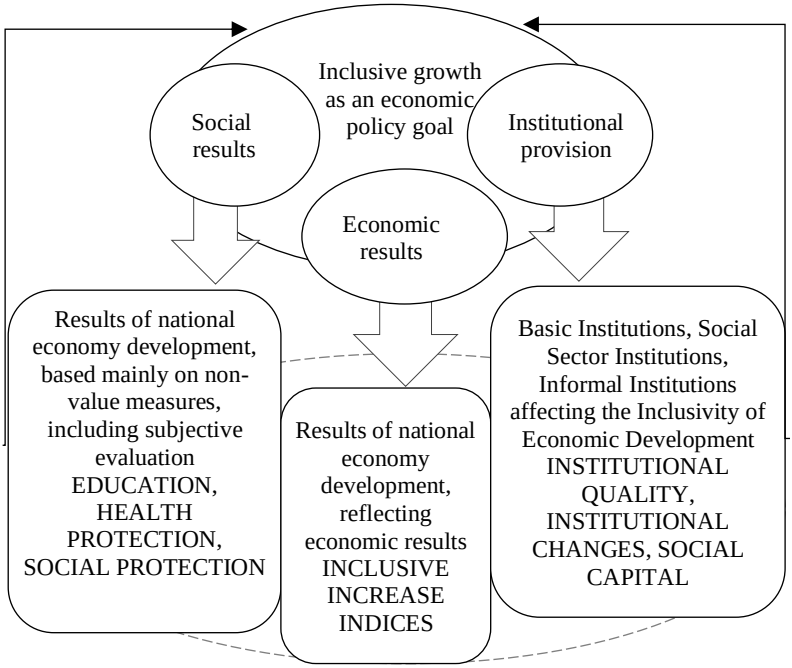


Figure 1.1. Components of the inclusive growth and their evaluation indices

Source: author's investigation

The generalized results of the works of Pacetti-Garr E., (2016), OECD (2016a, 2016c, 2018a) indicate that:

– the reform aimed at reducing regulatory barriers to increase internal competition, to boost trade and to attract foreign direct investment, can increase lower-middle-class income more than GDP per capita or average household income;
– social assistance increase for unemployed persons who have been unemployed for a long time without additional support (looking for work, retraining, promoting entrepreneurship can decrease the welfare level of this social group, even if there is a rise in the average income.

It means that in the context of ensuring inclusive growth, there is a need to analyze not only the income dynamics, the growth rate of macroeconomic indices, the structural policy impact on the social parameters of national economy development, but also a comprehensive multidimensional assessment of the economic policy impact on multidimensional living standards, as well as the factors that determine it.

Statistics show that the multidimensional standard of living increased at a higher rate than GDP per capita during the period 1995-2007 in OECD countries. In these countries, the standard of living has increased on average by 3.9% per year compared to the average GDP growth of 2.3%.

Increasing levels of multidimensional living standards have been uneven for groups of population with different income level - the poorest groups have experienced the greatest increase in income inequality. However, the fall of the multidimensional index of living standards after the crisis was quite significant and exceeded the GDP per capita in some countries, which testifies to the negative impact of economic inequality on welfare levels and actualizes the implementation of inclusive growth mechanisms that should reduce the negative effects, not of the economic factors, but of the population's welfare.

It should be noted that income inequality is a natural objective phenomenon of the market economy, where human capital of different qualities is valued differently. However, it should be remembered that such conclusions are valid in an environment where everyone has equal access to social services that contribute to the growth of the human capital quality (education, health care, financial resources, etc.). Imbalance in all its manifestations hinders the economic development and growth since it changes the age-proportions of labour mobility, deprives incentives to invest in human capital, which in turn inhibits potential growth. Certainly, each country has its own peculiarities about the imbalance in the broad sense. At the

supranational level imbalance is given much attention because it points to the existence of barriers to the full participation of the most vulnerable members of society in economic and social life.

Given the importance of such aspects as overcoming inequality, the social services quality (education, health care, social protection), it is important to create, first, an information and analytical base for awareness regarding the development of the social sector in the national economy, and secondly, based on it to develop a general concept and specific mechanisms and instruments to implement the social block of inclusive growth tasks in the state regulation.

1.2. The measurability of the inclusive growth

Generalization of scientific results from native and foreign scientists' scientific researches on measuring the inclusive growth lets distinguish 2 generalized theoretical and methodological approaches:

1. An approach that involves the calculation of a single comprehensive index that integrates a number of individual indices.

2. An approach involving the use of individual indies, usually grouped by blocks.

At present, considerable work has been done in determining the appropriate indices for both native and foreign scientists, which is summarized in Table 1.1.

Working on the measuring of inclusive growth, Ukrainian scientists have proposed a number of improvements. Thus, A. Basiluk and Zhulin OV (2015) proposed to evaluate inclusive growth by 2 components: the inclusive growth index as a ratio of GDP to the key macroeconomic indices and the inclusive growth index as an estimate of the access level to opportunities and outputs. Vlasenko Yu. G. (2019) proposed to define the Inclusive Development Index on the basis of the Integral Index

of Access to Opportunities and the Index of Access to Labour Results, which include basic economic, social, environmental and humanistic indices of development.

Table 1.1. Inclusive growth measurement approaches

Measurer (s)	Components
Set of indices, OECD (2018a)	There are four groups of indices: 1) growth and provision of a fair distribution of the growth benefits (7 indices) 2) Inclusive, well-functioning markets (7 indices); 3) Equal opportunities and fundamentals of future prosperity (7 indices); 4) regulation.
Inclusive Growth and Development Index – IDI, WEF (2017).	It is based on 3 components: growth and development (country's GDP per capita, labour productivity, employment rate and life expectancy); Involvement and intergenerational equity (average household income, Gini coefficient, poverty rate; sustainable management of natural and financial resources (share of GNI savings, share of public debt in GDP, ratio between unemployed and working-age population, intensity of greenhouse gases).
A group of indices, proposed by UNDP (2013)	1) revenue-related indices; 2) non-revenue-related indices; 3) indices of growth and economic opportunities expansion; 4) infrastructure indices; 5) social equality for equal access to economic opportunities; 6) access to social infrastructure services; 7) gender equality; 8) the system of social guarantees; 9) effective public administration and public institutions
Inclusivity Index, IMF	2 groups of indices: 1) macroeconomic indices (GDP per capita, debt ratio in GDP, investment volume, inflation rate, government expenditures, GDP volatility; 2) structural indices - economy openness, education level, financial openness, FDI volume, ICT development, quality of infrastructure, export of services and goods.

Source: developed by the authors

Therefore, we can conclude that the main prerequisites for the inclusive growth concept include the understanding of the imbalance as a brake on economic growth (in OECD countries, the income gap between 10% of the richest and 10% of the poorest in 1985-2013 increased from 7 to 10 times) and the OECD External Shock Resistance (2016a).

The analysis of social and economic problems at the present stage, and their coverage of the expert and scientific environment makes it possible to summarize the reasons underlying the corresponding transformation of national economies in many countries, which led to the need to change the traditional model of economic growth to inclusive ones:

- transformation of the labour market as a result of technology development, deepening of digitalization processes. As a result, there has long been a gap between demand and supply for certain professions, and consequently, widening income inequality;
- changes in the labour relations sphere as a result of labour markets liberalization. The OECD estimates that during the 2010s, the proportion of self-employed and part-time workers in the total employment structure of OECD Member States was about one-third. The financial crisis has led to problems with income levels and increased imbalance even in developed countries. It also gives reason to expect an increase in differentiation in the income of the various OECD societies (2016a);
- tax mechanisms imperfection of income redistribution, which exacerbated economic inequality and caused an increase in the debt burden on the budgets of different countries;
- transformation of social protection mechanisms of the population, which caused more stratification of income, reducing the ability of the least protected categories of the population to invest in education for their own development, health care, etc;

– negative financial consequences for the population of the least-paid categories (rising debt-to-assets ratio, low level of lending).

1.3. Social capital as a factor of inclusive growth

The development of social capital as a set of socio-economic relations based on trust, norms and networks of cooperation, allows increasing the efficiency of social development and economic growth. Modern approaches to defining social capital emphasize its institutional nature and complex social, economic and cultural nature. Therefore, justification of the factors that determine social capital development is the basis to develop a mechanism for its regulation. The issue of measuring social capital, its impact on economic growth, has become especially relevant today.

Analysis of the research shows that social capital is one of the most important features of the social sector institutions development, although approaches to its definition are being changed with the development of the category itself. Initially, social capital was seen as a resource that let us realize the individuals' interests in the process of their interaction (Baker, W. 1990). Today, it is most common to understand social capital as the ability of people to work together for common goals. Fukuyama F. (1995) defines it as a set of informal rules and norms that are established between people that let them interact. He identifies it with trust, placing it in line with the classic factors of production - physical capital, as aggregate and human capital, giving a reason that trust increases the potential for the productivity of relationships between people.

In the scientific studies, social capital was introduced by Putnam, R. (1993), in which a comparative analysis of the

institutional and economic development of the northern and southern regions of Italy was carried out. Cooperative capacity, in his view, determines social capital. Putnam, R. (1993) observes trust as a source of social capital, which is realized through cooperation and coordination of people's actions and uses qualitative indices of civil society development and civic engagement. According to the definition of Putnam R. D. (1995: 67), social capital means "features of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit." Putnam R. D. (1995) emphasizes that social capital is formed through the establishment of horizontal bonds and associations between people - the formation of networks that affect the productivity of society. Such an impact can have both positive and negative impacts on society, but a key feature of social capital is the facilitation of co-operation and coordination between members of the associations in order to achieve mutual benefits. He demonstrates social capital through the number of relationships between people in local communities in the areas of community or organization life, involvement in public affairs, community volunteering, informal sociability, and social trust.

Some scientists emphasize the complex and, as a rule, abstract nature of the social capital components and point out the complexity and even impossibility to measure it. Therefore, they consider that it is necessary to evaluate social capital, not directly, but by identifying and evaluating its manifestations. The resources such as information, ideas, and support are related to social capital as opposed to education or skills related to human capital or technology related to physical capital, Grootaert, et. al. (2004).

Social capital is a concept that determines the importance of social contacts between groups and within groups of people, providing additional effects. First of all, it means that social

networks have a related meaning and that they are not always detrimental.

The social capital concept emphasizes the fact that networking creates productivity gains for people, teams and organizations. This increased productivity can be both financial and of other forms.

Social capital, like any other form of capital (human, physical, financial) is also important and valuable for the functioning of society.

Let us explore the features that allow it to be included in the structure of other capital. First of all, the term "Capital" is associated with the following three terms: wealth, money and income.

Capital is that part of the wealth that is used to perform the production activity. So wealth is a broader concept than capital. If a commodity has such features as scarcity, utility, and turnover, it acquires the properties of wealth. When these elements are used in the production process, it becomes a form of capital. Therefore, any product becomes capital only if it is used for production.

Usually, capital means investing money in business. But in the economy, money becomes capital only when it is used to buy real capital goods, unlike consumer goods. Money is not a factor of production, but being exchanged for the elements of real capital, it becomes a factor of production. Production requires real capital and monetary capital, but monetary capital must take the form of real capital.

Therefore, productive capital refers to anything that can be used for production purposes by a firm or an individual. Economic or financial capital requires investing cash in such areas as equity, debt, or real estate.

Human capital and social capital complement the purely economic justification of capital and together explain better how business actually works and economic growth is provided.

Human capital refers to the intangible component of a company, but its contribution to its company is equally important. Human capital refers to the skills that employees of the company implement in the production process of goods, services, work.

Although it is difficult to calculate human capital in terms of value, most companies invest in improving employees' productivity through training, professional development seminars and healthy living programs. Many businesses choose to invest in the happiness and well-being of their employees, since these investments indirectly have success as a result, generating a more productive and efficient workforce.

Social capital is a more intangible asset because it relates to the relationships that are formed between different people and are based on the desire to form their social networks and to carry out general operations. Community members tend to focus on helping and encouraging those who are in their one social network, creating a cycle of beneficial reciprocity. In general, social capital means people-to-people relationships, but not the product of network members.

Social capital is associated with other types identified by sociologists and anthropologists, such as symbolic capital - for example, honor and status gained through trust or promotion; and cultural capital, such as the ability to recognize and appreciate high-end items such as art or fine dining and differentiate them from more middle-aged consumption.

The concept of sustainability in development involves the allocation of social capital in addition to the other four. Therefore, there are five types of sustainable capital. The concept of sustainable development will let form the most optimal ways to manage capital assets in the long run. It is a dynamic process through which organizations can begin to strike a balance between their environmental, social and economic activities. Natural capital is any stock or flow of energy and

materials that create the form and material content of produced goods, performed works, provided services. Natural capital includes resources (renewable and non-renewable materials), resource recovery systems and emissions prevention

Thus, poorly managed natural capital becomes not only environmental but also social and economic responsibility. Excessive use of natural capital can be a problem not only in terms of biodiversity loss but also a catastrophe for humans, as ecosystem productivity and resilience decline over time and some regions become more prone to extreme events such as floods and droughts. After all, it complicates community functioning and can potentially lead to conflicts in population migration and the like.

Human capital consists of people's health, knowledge, skills and motivation. All these things are required for productive work. Increasing human capital through education and training is a major driver of a sustainable, emerging economy.

Social capital refers to institutions that help to support and to develop human capital in partnership with others; such as families, communities, businesses, unions, schools, and voluntary organizations.

Productive capital consists of material goods or fixed assets that contribute to the production process. It is not the production process itself - such as tools, machines and buildings.

The crisis of sustainable development arises because the consumption of natural, human and social capital stocks is faster than they are produced or restored. Unless this consumption is controlled, then these important stocks cannot be maintained in the long run.

We consider the most appropriate areas of social capital reproduction to be safe, favorable living and working conditions; formation of incentives to increase respect and to follow the local, national and international law; social infrastructure support; formation of an effective

communications system; generating and maintaining a system of shared values and goals; promoting open, transparent and fair management systems.

The term social capital is used in various forms in different disciplines. For example, the World Bank uses it to define social and economic development. Corporate professionals similarly use it to interpret approaches to organizational development.

Within our economic research, we are interested in social capital as a determinant of inclusive economic growth.

Many studies have been devoted to exploring economic growth factors between countries and regions. Traditionally, economic studies have highlighted such factors as the relative stock of physical and human capital, the technological potential of the economy, the ability to produce and disseminate knowledge and innovation, management and leadership skills in business and the state, as well as the degree of liberalization of the domestic and international markets. However, economic analysis has paid less attention to social regulation, which is actually conducive to development and reform. In our analysis, we examine the impact of social organization features that include trust, norms, and networks, and fall within the concept of social capital.

Social capital promotes economic growth, emphasizing the importance of cooperation and trust within the firm, the market and the state. The interdependence between the decisions of individual agents and the emergence of external and common benefits makes the necessary cooperation for maximum social welfare. The advantage of social cooperation has long been recognized in economic and social thought. But social capital, as social norms and networks, supports cooperation, emphasizing its internal value and aspiration as an end in itself. It is an interaction in which individual behaviour takes into account its impact on the well-being of others, along with one's own. Thus, it functions as an internal mechanism of commitment

to addressing the social dilemma or collective action. Empirical work on social capital, covering a wide range of interdisciplinary studies, explains the differences between regions and countries in terms of levels and rates of economic and social development to the differences in the available stock of social capital. Regions or countries with relatively high levels of social capital, in the context of generalized trust and widespread civic engagement, appear to be at higher levels of growth than low-trust societies. Social capital promotes efficiency and growth, fostering cooperation between individual conflicting interests to achieve increased production and fair distribution.

Native scientists also discussed the nature and need of social capital research. Burkinsky B.V., Goryachuk V.F. (2013) substantiate the relevance of the topic through the emergence and development of negative processes in the social and economic sphere: moral, cultural, intellectual and managerial impoverishment; degradation of the ruling and entrepreneurial classes; demonstrative, cynic, legal and moral norms and requirements of society; degradation of the public administration system due to widespread corruption and incompetence; transformation of corruption into the basic social mechanism for solving public affairs; activity of civil servants and politicians as agents of external influence, resulting in widespread distrust of existing state institutions; a total crisis of public spirituality and morality; a systemic demographic crisis (in particular, Ukraine's lagging behind the leading European countries in terms of life expectancy); large-scale labour migration with a tendency to develop into a fixed one; infrastructure and institutional mismatch of the economy to the demands of the times.

It is possible to overcome these negative manifestations by improving the effectiveness of social interactions or in other words - development of social capital.

Robison, Lindon J. & Schmid, A. Allan & Siles, Marcelo E., 1999 mentioned that not all scientists agree with the term "capital" in the social capital situation used to describe relationships between people and when sympathy and feelings of duty can bring potential benefits. These scientists came into the discussion after Kenneth Arrow's call to abandon the metaphor of capital and the term "social capital." He stressed that the term "capital" refers to the rejection of consumption today for the sake of future benefits, which, in his opinion, are inappropriate to describe social networks organized for other reasons, then the economic value for participants. However, in reality, social capital can help attract savings and investment today by increasing trust in the communications and interactions process for future benefits, and Arrow's objection seems out of place. Thus, the idea emerged that in order to qualify as "capital", an entity must have an alternative cost but it is absent in the social capital.

Robison et.al. (1999) emphasize that such differences arose from different approaches to capital by economists and sociologists. The latter qualify capital in any form as capital only if it makes people more productive by using it in combination with other forms of capital. Sociologists can classify social capital as "good" or "bad" depending on whether it is useful to a person in this context. An economist cannot call a "bad" social system social capital, although it may be qualified as an economic institution. In this regard, it is not correct and justified to require the use of capital only for productive versus destructive purposes. For example, an enterprise can produce products (good) and create pollution (bad). But certain negative consequences of production activity do not give the right not to call the enterprise the capital.

It means that studying the term "social capital", it is advisable to consider the peculiarities of other types of capital, which still lets it put with them in one row. So, first of all, "capital" can be

defined as an accumulated stock that contributes to higher income or better results. In addition, there are five processes in which social capital can deliver better results by promoting greater collaboration.

First, the increase of social capital with its higher degree of horizontal ties improves the management system efficiency. Second, increasing social capital leads to increased community action and resolves local "shared ownership" issues. Third, increased social capital strengthens people-to-people relations, accelerating the spread of innovation. Fourth, increased social capital improves the quantity and quality of information flows and reduces transaction costs. Finally, fifth, social capital diversifies risks and allows households engaging in riskier activities and receiving higher returns. This list is, in fact, interesting and useful to discuss the possible effects that social capital can gain. However, they do not describe the essential properties of capital, in particular, physical capital, as defined by economists.

The main properties of physical capital goods are service potential, durability, flexibility, substitutability, decline, reliability, investment and exit opportunities, ability to create one form of capital from another, and ethics of use.

Investigating the approaches to the definition of social capital, its sources of origin, forms of existence, the leading Ukrainian scientists Burkinsky B.V. and Goryachuk V.F. (2013), Mishenin, Ye.V. and Oleynik N.V. (2008) also come to the conclusion that traditional indices used in statistical and sociological surveys in Ukraine (social tensions, cynicism index and national distance index, etc.) and in international practice (such as the Corruption Perceptions Index, the Government Index and the Economic Freedom Index) cannot characterize it the integrated way.

Burkinsky B.V. and Goryachuk V.F. (2013) think that it is reasonable to base the assessment of social capital on a measure

of trust, which will be measured by a set of indices in two dimensions: total trust between people and institutional trust.

One of the key problems encountered in the study of social capital is the choice of an adequate index or group of indices that fully describe the essence of social capital and make it material.

Summarizing the above, let us mention that the basic measures of social capital are based on the features of social relationships (structures), built on the principles of trust and interaction. Currently, the most relevant indices to measure social capital are based on results that reflect: networking, trust, interaction. Therefore, indices of social capital traditionally use Indices of Social Development based on indices derived from 25 updated sources of information. In our opinion, these are the most relevant indices that can be used to describe social capital. They fully meet the requirements of complexity, easy measurement, sustainability and ability to be used at both local and national levels. Social development indices consist of six integrated indicators.

2. PRACTICAL ASPECTS FOR ASSESSMENT OF THE COUNTRY'S SOCIAL, ECONOMIC AND POLITICAL DEVELOPMENT LEVEL IN THE CONTEXT OF THE IMPLEMENTATION OF THE INCLUSIVE GROWTH CONCEPTION

2.1. Determination of the integral index of the country's economic development taking into account the influence of qualitative features of public administration

The activation of globalization and integration processes causes a dynamic and fundamental transformation of the economic systems functioning, both at the micro and macro levels. So, if the main task, which is actualized in modern conditions at the level of an individual business unit, is to build the most adaptive management system to changes in the environment and, at the same time, rather resistant to the destructive influence of exogenous factors, then the task is more complicated at the national level, and the ways to solve problems are ambiguous.

The dynamic stage of world economic relations development causes the intensification of transformation processes at different levels of interaction between economic agents, but the most ambitious and important thing for the country's macroeconomic stability is to improve conceptual foundations and to increase the practical implementation effectiveness of measures within the state economic policy.

Over the last few decades, a number of economic concepts have been radically transformed. Thus, until recently effective patterns of state regulation of the economy have lost their relevance, which necessitates their permanent updating and updating in the light of new endogenous and exogenous challenges. It should be noted that one of the problems, which is

of primary importance at the current stage of development of world economic relations, is the construction of a public administration system that would ensure maximum economic growth. At the same time, the effectiveness of achieving this goal depends not on the combination of tools used by the executive authorities, but on the qualitative features of the management system itself and the coordination of actions between different institutions, authorized to implement measures within one or another direction of the state economic policy.

The popularization of the approach according to which the impact of various regulatory instruments on individual macroeconomic indices of a country is largely driven by qualitative and largely subjective features of the governance system (management system) can be explained by the emergence of an increasing number of behaviorism followers and behavioral economists among practitioners. This trend is not devoid of reasoning since any administrative system is primarily formed by people. Therefore, it may be quite probable that for one country (with its historical prerequisites and qualifications of the public authorities apparatus) certain instruments of state regulation operate effectively and for the other, at first glance, similar in number of parameters, the same instruments are absolutely not valid, which is the reason why there is a considerable divergence in the internal organization of the state regulation system.

However, state regulation instruments can have a positive and significant impact on one macroeconomic index and, at the same time, be completely irrelevant to another similar parameter. For this reason, the impact of government regulation instruments should be assessed not on the basis of a single index, most commonly found in empirical studies, but on the basis of a set of macroeconomic determinants, which are most sensitive to

certain instruments regarding state regulation of economic processes. In this regard, the main objective of this empirical study is to develop an integral index of the country's economic development with a high level of sensitivity to the quality of regulation and the public administration efficiency. The development of such an integral index will test the impact of various regulatory instruments, which in turn will accelerate their filtration and predict the potential effects of their possible use, demonstrating the practical value and relevance of such empirical results.

The study of the impact made by the qualitative features of state regulation on the country's economic development parameters is the object of many scientific works, which vary by time horizon, the sample of countries, as well as a set of factor and result parameters.

However, in the context of this study, a block of factor variables reflecting the qualitative parameters of the government's economic regulation system forms two indices from the six World Governance Indices calculated by the World Bank Group, namely regulatory quality and government effectiveness). The quality of regulatory index reflects the effectiveness of the executive authorities in creating a favorable business environment in the country. Instead, the "government efficiency" parameter reflects the overall progress of executive bodies in the context of state regulation of the economy, the main index of which is the confidence and loyalty of economic agents to government decisions. Both indices can vary in the range [-2.5; 2.5], where the higher value of the factor corresponds to its better manifestation in the country, i.e higher values of indices is evidence of better government efficiency or regulatory quality, respectively.

These indices are chosen due to their widespread use in a number of scientific studies, among them the works of Jalilian

H., Kirkpatrik C., Parker D. (2007), Alam M. R., Bedane B. G., Kitenge E (2017) and others. Given the need to identify the impact of both selected factor traits on a number of productive parameters, it is advisable to aggregate them into one index of state regulation features. Taking into account that these parameters are equivalent, their aggregation is realized on the basis of additive convolution with the same weighting coefficients - 0.5.

In its turn, the analysis of scientific researches regarding identification of the interrelation nature between the qualitative features of state regulation and the country's economic development parameters made it possible to establish that the key parameters of economic development in these studies were GDP growth per capita; real GDP growth; GDP per capita by purchasing parity in 2005; volume of investments (gross fixed capital formation as a percentage of GDP); trade openness (ratio of exports and imports to GDP); inflation (consumer price index) and size of government (total government final consumption expenditure relative to GDP).

Thus, taking into account the existing achievements of Western scientists, the set of productive variables that will be tested for the relationship with the qualitative features in the state regulation of the economy included the following indices from the World Development Indicators database study, formed by the World Bank Group: current account balance as a percentage of GDP; GDP growth,%; GDP per capita, US dollars; GDP deflator; total government final consumption expenditure on GDP,%; gross capital accumulation as a percentage of GDP; ratio of total volume of exports and imports to GDP,%; consumer price index,%; international liquidity indicator (volume of total reserves in months of imports); total reserves US dollars; export of goods and services, US dollars; imports of

goods and services, US dollars; employment, % of the total population.

Thus, the statistical basis of the study is the statistical set in the context of the above factor and outcome parameters accumulated by the World Bank Group. Taking into account the necessity to universalize the obtained results, the study will be conducted for 40 countries in the world, which mainly belong to European countries and former USSR states, namely: Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Macedonia, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden Switzerland, Tajikistan, Ukraine and United Kingdom. Such geographical specification of the analysis is conditioned by a historical retrospective (for a considerable period of time Ukraine shared the priorities and tools to implement public administration of economic processes with the countries of the socialist bloc) and promising vectors of national economic policy. That is why the sample included also the developed European countries, which are the leaders of the European Union's economic development strategy. The time horizon of the study covers the period 2002-2016.

The first stage of the study is to identify the impact of the public administration quality on economic development indices, which will be carried out on the basis of the regression modelling tool using panel data. The technical task was accomplished with the help of the Stata 12 / SE software.

The task of this stage in the study is to identify those indices of the state economic development that have a statistically significant relationship with the formed integral quality index of

state regulation of the economy. Therefore, the results of the regression analysis are presented in appendix A, table A.1.

Therefore, according to table A.1 (based on the value of P> | t |, which reflects the statistical significance of the factor parameter and should not exceed 0.1, which corresponds to 90% of the confidence interval), it can be observed that from the whole set of economic development indices, statistically significant at one of the acceptable confidence intervals (99%, 95% or 90%) is the impact made by the quality of state regulation of the economy on 7 indices, namely:

- current account balance in relation to GDP (an increase per unit of the integral index of the qualitative features in the state regulation of the economy leads to an increase in the current account in GDP by 2.11%);
- GDP growth,% (improving the quality of government regulation of the economy contributes to GDP growth by 1.67%);
- GDP per capita, US dollars (improvement of quality parameters regarding the economic processes regulation per unit lets to increase the effective index by 8867.61 US dollars);
- the total expenditure of government final consumption in relation to GDP, % (improvement per unit of quality regarding the government regulation of the economy requires a 1.18% increase in the total expenditure of government final consumption by GDP);
- gross capital accumulation in a percentage of GDP (growth of the factor feature per unit is accompanied by an intensification of the capital accumulation process by 1.18% to GDP);
- international liquidity index (total reserves volume in months of imports) - the value of the index is slightly less than 90%, but given the small step of this deviation, we will also take this parameter as significant (improvement of the state regulation

of the economy is a slight reduction of amount of the total reserves in in months of imports by 0.46%);

– □ employment of the population,% to the total population (an increase of the state regulation efficiency activates the increase of the employment rate in the total population by 0.84%).

However, it has not been confirmed that the improvement of the qualitative features of state regulation of the economy has a statistically significant positive impact on inflationary processes and the country's foreign trade.

It should be noted that the macroeconomic indices selected at this stage (for which the relation to the factor variable was statistically significant) will form the basis to form a consolidated integral index of economic development with a high level of sensitivity to changes in the qualitative parameters of state regulation of the economy.

Therefore, at the next stage of this study seven previously selected parameters of economic development will be integrated into a single index based on the additive-multiplicative convolution (formula (2.1)):

$$I = \sum_{j=1}^{k} \omega_j \frac{x_{ij}}{x_{\max j}} + \sum_{j=k+1}^{n} \omega_j \frac{x_{\min j}}{x_{ij}} + \prod_{j=1}^{k} \left(\frac{x_{ij}}{x_{\max j}}\right)^{\omega_j} \prod_{j=k+1}^{n} \left(\frac{x_{\min j}}{x_{ij}}\right)^{\omega_j} \quad (2.1)$$

The specified convolution method is chosen due to the properties of the parameters included in the sample. In particular, in order to reduce the dimension of the sample of relative indices, the best option is a multiplicative convolution. However, in this case, the use of zero values in the normalization of indices is quite limited. Therefore, in order to counteract this problem, an additive-multiplicative convolution is used, which

combines the advantages of additive and multiplicative convolution methods.

It should be noted that, in the context of the second stage of the study, several tasks should be solved, namely, to classify the macroeconomic indices into stimulants and stimulators, to normalize them with regard to the identified nature of the impact, and to determine the weighting factors that show the significance of every index.

Thus, based on logical considerations and taking into account the results of the previously conducted regression analysis, from the set of presented macroeconomic indices, all parameters are stimulators except the government's total final consumption expenditure in relation to GDP. It should be noted that the first stage regression analysis revealed a direct correlation between the quality of government regulation and the share of total government spending on final consumption in GDP. However, we believe that the effectiveness of the executive bodies operation in the sphere of economic policy should be implemented not by the extensive (due to the expansion of the apparatus financing), but intensive way. It means that with a simultaneous reduction of public expenditures in this direction. Based on such considerations, this parameter was qualified as a destimulator.

In addition, taking into account the fact that such parameters as the current account balance in relation to GDP and GDP growth can be negative, and completing the normalization phase, the values of all indices should be in the range from 0 to 1. The process of bringing them to a comparable view will have a minor difference in comparison with the rest stimulant parameters. In particular, when the actual value of the index is negative, its normalized value will automatically be "0" (undoubtedly, slight current account deficits and GDP reductions do not have negative consequences for the state of the

economy as a whole, but the lack of scientifically substantiated thresholds, after which the impact of these parameters causes a destructive effect, in the context of this study, we accept the hypothesis that any value below zero is negative for the stability of the economy as a whole). At the same time, when the actual value of these indices is positive, normalization will be carried out as a ratio of the current value to the maximum for the whole group of countries and time horizon, but within the studied index.

However, the rest stimulator indices will be normalized according to the traditional formula, which assumes the ratio of the normalized values to the maximum sampled values of the feature. Therefore, the destimulator is normalized by dividing the minimum parameter by its normalized value according to the sample countries and the time range of the parameter. Thus, at the end of the normalization stage, all seven sub-indices will be proportional (the value of the indices is in the range [0; 1], the higher value of the parameter corresponds to its more desirable value based on economic growth provision).

Another task to be solved in the second phase of the study is to identify the weighting coefficients for the obtained subindices. Taking into account the lack of adequate and justified algorithm to define the priority and weight among the analyzed macroeconomic indices, we assume their equivalence, and therefore the weighting factor for each of the parameters will be "1/7". Thus, the final stage of this study is the calculation based on the revealed subindices of the integral index of the country's economic development using the additive-multiplicative convolution method (formula 2.1).

One should point out that the integral index was calculated for all 40 countries that were included in the sample, but first of all, let us consider its graphical interpretation for Ukraine in detail (fig. 2.1).

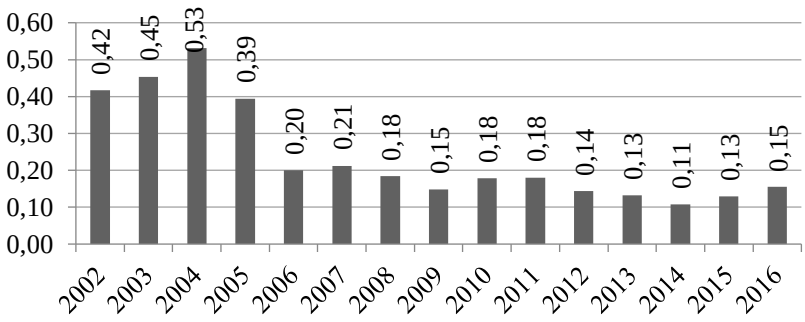


Figure 2.1. Graphical interpretation of the dynamics regarding the integral index of economic development of Ukraine for 2002-2016, unit

Therefore, based on the above data, it can be noted that the dynamics of the integral index values of economic development, which is sensitive to changes in the qualitative parameters of state regulation of the economy, during the analyzed time, is not described by a constant trend.

In particular, the maximum level of the analyzed index was fixed in 2004 - 0.53, which is only 28.5% of the maximum possible value of the index (provided that all sub-indices acquire a single value, the integral index of economic development will be 1.86). It should be noted that 2002-2005 as a whole were favourable from the point of view of the economic development dynamics, which is confirmed not only by these calculations but also by the official statistical parameters of that period. In particular, 2002-2005 is a period of pre-crisis intensive development of the financial sector (the level of public confidence in banking institutions was significantly increased, the scope of lending to the population was expanded, etc.), balanced fiscal policy (during this period budget surplus was fixed, which is unprecedented the case for the whole period of

Ukraine's independence), moderate but steady economic growth, etc.

However, during the deployment of destabilization processes in the period of the global financial crisis, the analyzed index was significantly deteriorated - its level decreased almost twice, compared to the maximum for the period, and has not recovered to the pre-crisis state to date.

It is worth noting that a slight improvement in the economic situation was observed during 2010-2011 when the Ukrainian economy gradually recovered after the destructive impact of the crisis processes. First of all, this period was characterized by important qualitative transformations - the banking sector was rehabilitated, the fiscal policy was radically reformed (the Tax Code was adopted and a number of important changes were made to the Budget Code of Ukraine). However, the stabilization and recovery period was not long, and already at the end of 2012-2013 internal crisis processes were intensified (this period is characterized by a latent economic crisis, which was accompanied by a decrease in foreign exchange reserves and a sharp fall in UAH exchange rate, which in turn led to to the large-scale devastating effects on the activity of business entities and the total outflow of foreign investment from most sectors of the economy).

In turn, the latent economic crisis in 2014 was exacerbated by political instability, a violation of Ukraine's territorial integrity, and the outbreak of a military conflict, which quite naturally led to the fall of the analyzed index (this year the minimum value was fixed for the period of 2013 and a decrease was 15,38% compared to 2013.

At the same time, at the end of the observed period, there is a certain increase in the integral index of economic development, which, despite the unresolved political and territorial problems, indicates some progress in the economic sphere, which is also

quite justified, since after the 2013-2014 events the economic policy course became stable in Ukraine, and a number of important reform initiatives have been launched to democratize, improve the transparency and effectiveness of government regulation of the economy.

Table 2.1. The value of the integral index of economic development for the states - former republics of the USSR included in the sample

Year	Azerbaijan	Armenia	Belarus	Georgia	Estonia	Kazakhstan	Latvia	Lithuania	Moldova	Russia	Tajikistan
2002	0,29	0,26	0,14	0,23	0,20	0,24	0,20	0,18	0,17	0,49	0,23
2003	0,31	0,27	0,15	0,26	0,21	0,24	0,20	0,20	0,16	0,54	0,23
2004	0,31	0,25	0,18	0,20	0,21	0,50	0,21	0,18	0,20	0,60	0,19
2005	0,64	0,27	0,43	0,21	0,22	0,25	0,23	0,19	0,21	0,62	0,16
2006	0,88	0,30	0,19	0,22	0,25	0,30	0,26	0,20	0,18	0,66	0,18
2007	0,90	0,31	0,20	0,21	0,24	0,27	0,26	0,24	0,20	0,68	0,22
2008	0,88	0,28	0,22	0,14	0,18	0,58	0,19	0,18	0,22	0,62	0,41
2009	0,74	0,22	0,19	0,12	0,17	0,23	0,23	0,14	0,14	0,27	0,17
2010	0,73	0,22	0,23	0,17	0,41	0,55	0,19	0,15	0,18	0,59	0,19
2011	0,55	0,22	0,23	0,20	0,48	0,65	0,21	0,19	0,18	0,62	0,18
2012	0,69	0,24	0,21	0,20	0,18	0,49	0,21	0,17	0,16	0,58	0,23
2013	0,73	0,21	0,21	0,18	0,39	0,52	0,20	0,42	0,21	0,48	0,19
2014	0,65	0,19	0,20	0,19	0,37	0,58	0,17	0,48	0,18	0,46	0,18
2015	0,21	0,20	0,17	0,19	0,41	0,24	0,17	0,15	0,15	0,26	0,18
2016	0,19	0,18	0,16	0,19	0,42	0,24	0,40	0,15	0,18	0,26	0,20
Min	0,19	0,18	0,14	0,12	0,17	0,23	0,17	0,14	0,14	0,26	0,16
Max	0,90	0,31	0,43	0,26	0,48	0,65	0,40	0,48	0,22	0,68	0,41

Source: formed by the authors

Thus, the analysis of the integral index dynamics of the economic development showed its objectivity, since the tendency of its change for Ukraine quite accurately reflects the real change of the macroeconomic situation. Therefore we

analyze its importance for the rest of the countries according to Table 2.1 (block of states - former republics of the USSR), table 2.2 (block of highly developed Western European countries) and table 2.3 (block of middle European countries).

Table 2.2. The value of the integral index of economic development for highly developed West European countries

Year	Austria	Belgium	Danemark	Finland	Netherlands	Norway	France	German	Spain	Sweden	Switzerland	GB
2002	0,4	0,4	0,4	0,5	0,3	0,6	0,3	0,1	0,1	0,4	0,5	0,1
2003	0,4	0,4	0,4	0,5	0,4	0,6	0,3	0,1	0,1	0,5	0,5	0,1
2004	0,5	0,5	0,5	0,5	0,5	0,7	0,4	0,4	0,1	0,5	0,7	0,1
2005	0,4	0,4	0,5	0,5	0,5	0,7	0,1	0,4	0,2	0,5	0,7	0,1
2006	0,5	0,4	0,5	0,5	0,5	0,8	0,3	0,5	0,2	0,6	0,8	0,1
2007	0,5	0,4	0,4	0,6	0,6	0,8	0,1	0,5	0,2	0,6	0,8	0,1
2008	0,5	0,1	0,2	0,4	0,5	0,7	0,1	0,5	0,1	0,2	0,6	0,1
2009	0,2	0,1	0,2	0,1	0,2	0,3	0,1	0,2	0,1	0,2	0,3	0,1
2010	0,5	0,4	0,5	0,4	0,5	0,6	0,1	0,5	0,1	0,6	0,9	0,1
2011	0,5	0,1	0,5	0,2	0,5	0,7	0,1	0,6	0,1	0,6	0,8	0,1
2012	0,4	0,1	0,5	0,1	0,2	0,8	0,1	0,5	0,1	0,2	0,8	0,1
2013	0,4	0,1	0,5	0,1	0,2	0,7	0,1	0,5	0,1	0,5	0,8	0,1
2014	0,4	0,1	0,6	0,1	0,5	0,7	0,1	0,5	0,3	0,5	0,8	0,1
2015	0,4	0,1	0,5	0,1	0,5	0,6	0,1	0,5	0,4	0,6	0,8	0,1
2016	0,4	0,3	0,6	0,1	0,5	0,6	0,1	0,5	0,4	0,5	0,8	0,1
Min	0,2	0,1	0,2	0,1	0,2	0,3	0,1	0,1	0,1	0,2	0,3	0,1
Max	0,5	0,5	0,6	0,6	0,6	0,8	0,4	0,6	0,4	0,6	0,9	0,1

Note: GB – Great Britain

Source: sampled by the authors

Comparing the values of the indices presented in Table. 2.2, it can be noted that the highest level of the studied parameter among the population of the represented countries was fixed in Azerbaijan, which is quite natural since this country has significant reserves of natural resources, which contributes to economic prosperity but does not have the same differentiated

structure as the Russian Federation. It lets effectively use the regulatory capacity of public authorities and maintain a positive economic growth rate. At the same time, the minimum value of the analyzed index among the represented group of countries is noted in Georgia and Moldova (the values of the index are almost identical to the same in Ukraine).

Table 2.3. The value of the integral index of the economic development for the medium-developed European countries that are in the sample

Year	Albania	Bulgaria	Serbia	Macedonia	Slovenia	Czech Republic	Greece	Hungary	Iceland	Ireland	Italy	Romania	Poland	Slovakia
2002	0,27	0,19	0,21	0,16	0,46	0,20	0,18	0,17	0,36	0,21	0,16	0,20	0,17	0,22
2003	0,28	0,19	0,20	0,16	0,21	0,20	0,19	0,16	0,18	0,21	0,17	0,18	0,17	0,22
2004	0,27	0,20	0,24	0,18	0,22	0,20	0,18	0,18	0,23	0,23	0,18	0,22	0,18	0,20
2005	0,27	0,21	0,22	0,19	0,21	0,21	0,15	0,17	0,24	0,24	0,17	0,21	0,17	0,21
2006	0,28	0,22	0,22	0,20	0,22	0,21	0,18	0,17	0,26	0,25	0,18	0,24	0,19	0,21
2007	0,28	0,24	0,22	0,20	0,21	0,21	0,18	0,16	0,28	0,25	0,19	0,25	0,20	0,23
2008	0,26	0,23	0,21	0,19	0,20	0,20	0,16	0,16	0,22	0,21	0,18	0,25	0,19	0,21
2009	0,25	0,21	0,20	0,18	0,15	0,18	0,14	0,16	0,19	0,18	0,18	0,22	0,18	0,14
2010	0,24	0,20	0,19	0,19	0,15	0,19	0,14	0,31	0,21	0,44	0,19	0,22	0,19	0,17
2011	0,24	0,38	0,19	0,19	0,31	0,19	0,13	0,37	0,24	0,48	0,19	0,22	0,20	0,16
2012	0,23	0,20	0,18	0,18	0,15	0,18	0,13	0,17	0,20	0,39	0,18	0,22	0,19	0,37
2013	0,23	0,38	0,19	0,20	0,16	0,18	0,12	0,45	0,62	0,56	0,18	0,23	0,18	0,39
2014	0,22	0,34	0,16	0,21	0,51	0,39	0,13	0,45	0,55	0,66	0,35	0,22	0,18	0,41
2015	0,25	0,22	0,18	0,21	0,46	0,44	0,12	0,46	0,64	0,96	0,40	0,23	0,19	0,16
2016	0,25	0,53	0,18	0,21	0,49	0,47	0,12	0,46	0,78	0,75	0,42	0,22	0,19	0,16
Min	0,22	0,19	0,16	0,16	0,15	0,18	0,12	0,16	0,18	0,18	0,16	0,18	0,17	0,14
Max	0,28	0,53	0,24	0,21	0,51	0,47	0,19	0,46	0,78	0,96	0,42	0,25	0,20	0,41

Source: formed by the authors

This tendency can be explained by the active stage of the reform processes (mainly related to the European integration

processes), which is usually accompanied by the macroeconomic parameters' volatility, due to the need to adapt to the implemented reforms. Therefore, the upward trend in these countries can be expected to recover by 2020.

Among the highly developed countries, the highest integral index of economic development is peculiar for Switzerland and Norway, and the index level is high for Sweden, Denmark, the Netherlands and Germany. In contrast, the low value (especially in the last few years) of Finland, France and the United Kingdom, which on the one hand may be a signal for destructive processes exacerbation in these countries' economic sphere and, on the other hand, indicate relative resistance in terms of the response of macroeconomic indices to government regulatory action.

At the same time, among the sample of medium-developed European countries, the highest index is peculiar for Ireland and the lowest - by Greece. In general, the value of the analyzed parameter for this group is the least differentiated.

Thus, according to the practical implementation results of the scientific and methodological approach to the formation of an integral index of the country's economic development, taking into account the impact of public administration quality, it was found that such macroeconomic indices as the balance of current account in relation to GDP are most sensitive to changes in the public administration quality; GDP growth,%; GDP per capita, US dollars; total expenditure of government final consumption on GDP,%; gross capital accumulation as a percentage of GDP; international liquidity index (volume of total reserves in in months of imports); employment,% of the total population. The normalized values of these seven indices were the basis to form an integral index of economic development using the additive-multiplicative convolution mechanism. The analysis of the calculated index dynamics for Ukraine and the former member

states of the USSR, the medium and highly developed countries of Europe during 2002-2016 let to confirm its objectivity, as well as to mark the leaders and outsiders in each group. In turn, the obtained integral index can be used to test the strength of the country's economic system response to the use of a regulatory instrument that defines its practical value.

It should be noted that in the implementation of the economic policy in the state, it is important not only to identify specific indices of the economic development, which are most sensitive to changes in the quality parameters of public administration but also to identify the time lags, in the context of which this impact is strongest. It occurs because not always the change in certain qualitative parameters of the institutional environment of the state regulation system of the economy is reflected in macroeconomic indices without delay.

The task will be implemented using the regression modelling tool based on the panel data of the Stata 12 / SE software with a consistent lag input from 1 to 5 years. The results of the one-year lag modelling are given in appendix A, table. A.2.

Based on the results of the analysis (table. A.2), we can draw the following conclusions:

– introducing a one-year time lag has led to a change in the nature of the high-quality public administration parameters impact on such macroeconomic indices as GDP deflator, GDP growth and gross capital accumulation, with an increase in the statistical significance of the impact on the first and third significant values, whereas the second has not changed; on the contrary, despite the improvement in the defined link quality, the impact of high-quality government parameters on the GDP deflator remains irrelevant from a statistical point of view, while the link with gross capital accumulation is significant at the 99% confidence interval;

– the quality of the improving link regarding the public administration to improve the current account balance has slightly deteriorated but still remains statistically significant at the 95% confidence interval;

– the statistical significance of the effect of the factor variable on the ratio of exports and imports to GDP, exports of goods and services and imports of goods and services is improved, but still outside the acceptable confidence intervals, whereas the opposite pattern can be noted for the variable total reserves;

– the statistical significance of the remaining indices (with the same nature of influence) has improved markedly in the time lag of one year.

Table A.3 demonstrates the results of regression modelling with a lag of 2 years. According to the table, it can be noted that the increase in the influence lag continues the direction of development of most tendencies, defined in the transition from 0 to the annual lag, except for the following: the statistical variable of the effect made by the factor variable on the total final consumption expenditure in relation to GDP (P> | t | with a lag in 1 year - 0,001, and in 2 years - 0,068) although it is still acceptable; the quality of tie between state regulation quality and total exports and imports to GDP also has been worsened in comparison with 1 year time lag.

Table A.4 demonstrates the results of the regression modelling with 3 years lag.

Therefore, according to Table. A.4 the following regularities can be noted: if the lag is increasing, the quality of the link between the quality properties of public administration and such result variables as the current account balance with GDP, the ratio of total exports and imports to GDP continue to be worsened. At the same time, the effect of the factor variable on

GDP growth, GDP per capita, the volume of reserves in months of imports, and employment remain virtually unchanged.

It is worsening compared to the 2-year lag but is still statistically insignificant in any of the confidence intervals of the effect of the factor variable on such productive variables as imports of goods and services, exports of goods and services. In addition, thanks to the statistical significance deterioration of the impact, the changing effect of the management efficiency quality parameters on the state final consumption expenditure relative to GDP has lost its relevance within a 3-year lag but has almost become statistical significance at 90% confident interval.

Table A.5 shows the results of the regression analysis to reveal the qualitative features influence of state regulation of the economy on the country's economic development parameters with a 4-year lag. In particular, the following trends due to the growth of the lag can be noted: the quality of the relationship between the factor variable and the following macroeconomic indices continues to deteriorate: current account balance relative to GDP, total government final consumption expenditure relative to GDP, gross accumulation of capital in GDP, total reserves, exports of goods and services; the statistical significance of the influence of the quality parameters of public administration on GDP growth, GDP per capita, employment remained unchanged; the direction of the influence of the factor variable on the export of goods and services has changed (however, the link is absolutely insignificant) and the import of goods and services (the link is insignificant); the quality of the impact of the independent variable on the macroeconomic index "total reserves in months of imports" (reversed, significant at 99% confidence interval) and "GDP deflator" (reversed, significant at 90% confidence interval) increased.

Table A.6 demonstrates the results of the regression analysis of modelling with 5 years lag.

Similarly to the results of regression modelling for a 4-year lag, the statistical significance of the independent variable effect on the following parameters is almost unchanged: GDP growth, GDP per capita, imports of goods and services (the relationship is statistically insignificant at none of the allowed confidence intervals).

In turn, there was an improvement in the quality of communication of the factor variable with the following results: current account balance to GDP (direct impact, statistically significant at 99% confidence interval), GDP deflator (inverse impact, statistically significant at 95% confidence interval), gross fixed capital accumulation (inverse effect, statistically significant at 95% confidence interval). At the same time, for the other dependent variables, the values of the model coefficients are statistically insignificant at this lag.

Therefore, in general, the results of the analysis for the lag defining, with which the change in the qualitative features of public administration is reflected in the key macroeconomic indices, we can note the following:

- improvement of the state regulation quality has a positive and no-lag effect on the following macroeconomic indices: current account balance to GDP, GDP growth and GDP per capita;
- the maximum strength of the relationship between the factor variable and the total final consumption expenditure of the government in relation to GDP is a 1-year lag (direct effect);
- with a 2 years lag the improvement of the quality parameters of state regulation has the strongest and negative impact on the gross accumulation of capital to GDP and the export of goods and services;
- with a 4-year lag, the change in the factor parameter will have the strongest effect on the total reserves in months of imports

(inverse) and the total exports and imports ratio to GDP (direct link);

– the 5-year lag is the most appropriate for such macroeconomic indices as GDP deflator (inverse communication), imports of goods and services, employment - direct communication.

Thus, the identified lags should be taken into account in the implementation of the state economic policy, especially in the conditions of fundamental institutional transformations, which cause considerable volatility of the state regulation quality or the government effectiveness at the national level.

2.2. Scientific and methodological principles to assess social status in the country

An optimal system of state regulation of the economy should be characterized by taking into account the totality of ties between economic entities. A significant role in ensuring the economic system functioning is played by the effect made by the existing state of social development in the country, necessitating the application of regulatory measures aimed at improving the state of social ties, reducing social tension and intensifying the participation of the population in ensuring national development through the use of economic leverage. That is why the effective system of state regulation of the economy should be developed taking into account the possibilities of improving the social situation in the country and using it as a catalyst for the action of regulatory measures.

Issues regarding the assessment of social development are revealed both in scientific works and in methodological investigations of official organizations. At the same time, it is possible to note the absence of unified criteria that reveal the social development essence and allow it to be evaluated both at

a fixed point in time and in dynamics, which defines a considerable number of existing theoretical and practical approaches.

In this context, an important role is played by the choice of a comprehensive index for assessing the current level of social development, as well as determining the effectiveness of the implemented measures. It should be noted that the specificity and complexity to assess social status lies in a large number of aspects of public life organization that need to be taken into account. Moreover, many indices are qualitative features, which necessitates finding ways to formalize them for quantitative calculations. While developing an integrated index to assess social status, it is advisable to consider existing scientific approaches as well as indices used by the world organizations engaged in the study of social development.

Analyzing the scientific literature, there are two groups of approaches to the definition of social development. The first group considers social development as the process and result of social change under the influence of purposeful action (including under the influence of social policy). Thus, social development can be seen as a configuration of social policy aimed at strengthening the three aspects of social life - the general quality of life, the circumstances of life of all members of society and the quality of social relations. Midgley J (1995) defines social development as a process of planned social change worked out to promote the well-being of the population in coordination with the dynamic process of economic development. The United Nations Institute for Research on Social Development (2018) also offers a dynamic approach, describing the social development through changes that lead to improvements in human welfare, social relations and social institutions that follow the principles of democratic governance and social justice. Another group of scholars - Abdi A. A.,

Guo S. (2008) considers social development as a set of broad measures (economic, political, educational, technological) that affect people's lives.

In defining social development, another group of scientific approaches focuses on key aspects that describe it, such as equality and ability constancy (Pandey R.S., 1981), opportunities for the population (Dominelli L., 1997), welfare improvement (Mokate K., Saavedra JJ, 2006).

Given these approaches, social development should be considered as a process to change the basic parameters of the individuals' welfare and the level of social interaction that takes place both under the influence of regulatory measures and independently of them.

At the same time, it is necessary to define the set of these parameters. Analyzing investigations in this area, we will note the approach to the social development interpretation presented by Foa R., who observes it through three consecutive spheres of development: economic, which implies poverty reduction, social services and basic needs; human, encompassing literacy, education and skills, health; social, which relates to public life, involvement in organizations, trust and non-discrimination. Therefore, when considering social capital, it emphasizes the specificity of social institutions and their differences from political and management institutions, which are manifested, first, in the state independence, and, second, in the informal nature of their functioning. It determines the citizens' voluntary participation in the activities of such institutions and therefore can be a measure of the country's social development.

In the context of constructing an integral index to measure social status, one should pay attention to the approach of Pieper R. (2013), who envisages the interpretation of social development as a process of achieving social sustainability. In turn, the author views social sustainability as a set of processes

to ensure social quality, which is manifested in four interrelated aspects - social security, social expansion, social inclusion and social cohesion. In this case, each of these aspects reflects a specific subsystem of society, characterized by its own indices and specific risks. Thus, social security is the main manifestation of the economic subsystem, which is expressed in the provision of access to goods and services (access to resources), and its main indices are poverty risk, income disparity (Gini index), employment, social security and pension. Social expansion is considered in the context of the political subsystem functioning to provide opportunities to influence decision-making and achievement of social goals (health, skills, knowledge, power), and its indices are participation in associations, voting, the expectation of healthy life expectancy, etc.

Social inclusion as a manifestation of the cultural subsystem is interpreted by ensuring human and social rights, equality and the rule of law, respect for cultural diversity (values, rights, tolerance). Its main indices are access to cultural infrastructure, integration of migrants, secondary education, trust to institutions. Social cohesion is a peculiar manifestation of the subsystem of civil society characterized by providing trust, cooperation, care and expression of self-confidence (trust and emotions). Its main indices are the harmony of life and work, coverage of social care, friendship and family.

The specificity of this approach is to consider these manifestations in the form of interrelated elements that form the matrix. The social security and social inclusion are conditions for social sustainability, with social security being seen as a means and social inclusion as a goal. At the same time, social expansion and social cohesion reflect the potential of social sustainability - social expansion acts as a means and social cohesion as a goal. Thus, the author presents social sustainability in the form of a system for which social security is an input,

social inclusion reflects values, social cohesion is described by integration as a process of the system functioning, and social expansion is an output. It means that this approach demonstrates the significant level of relationship between social indices and the need for comprehensive consideration in analyzing social status.

Analyzing the approaches given by scientists and official organizations to the selection of indices for assessing the social status and development of the country, it can be noted that there is no single interpretation of the structure of the main areas under which the analysis is conducted. It does not let to concentrate on a particular vector of methodology development for assessing social status and necessitates the search for a system of parameters, which are able, on the one hand, to ensure that all aspects of social life are fully taken into account, and, on the other, to avoid duplication of information, represented by different indices and thus, to provide simplicity and ease of calculation by the developed method of compliance for its representation.

In order to select the most universal parameters, it is reasonable to carry out a comparative analysis of the social indices grouping in terms of the different approaches successfully used by international organizations in studying the issues to assess social status, which is presented in Table. 2.4.

The data presented in Table 2.4 demonstrate the differentiation of the approaches considered for the aggregation of social indices by direction. At the same time, it is possible to note common aspects in the above approaches, which are related to the simultaneous use of separate groups of social parameters in the general methodology or different distribution of similar indices between different areas of analysis.

Table 2.4. Approaches for the aggregation of social indices by direction

The main areas of social indices analysis	Organizations that report by social indices				
	The approach of the New York Mayor	Approach of OECD	The approach of the Ministry of Social Development of New Zealand	The approach of the International Institute for Social Research	The approach of The Social Progress Imperative
Basic needs					+
Education	+		+		
Health	+	+	+		
Welfare	+		+		+
Security	+		+	+	
Equality		+			
Work			+		
Social ties		+		+	
Intergroup unity			+	+	
Population		+	+		
Inclusion	+			+	
Strengthening	+		+	+	
Economic security	+	+	+		
Gender equality				+	
Opportunities					+
Dwelling	+				
Infrastructure	+				
Cultural identity			+		
Rest and Recovery			+		
Life satisfaction			+		

Thus, the International Institute for Social Research uses 6 indices to study its social development, which comprise its specific areas:

- public activism - is considered through the use of media and behaviour to express social protests. It enables to evaluate the potential for public influence on political decisions;
- clubs and associations; it is measured through citizens' participation in public organizations or associations, which is seen as a tool for minimizing social risks;
- intergroup unity – it is viewed through the level of cooperation and respect between different ethnic, religious or other groups that determines the reduction of social conflicts (terrorism, murder, abduction) and discrimination;
- interpersonal security and trust, it is assessed through the perception of the level of personal security in society, which determines the level of complexity to organize public activity;
- gender equality - is viewed through indicators of equal rights and gender discrimination in terms of the full realization of people's potential, skills and capabilities;
- minority involvement - measured by the level of discrimination of socially vulnerable groups in employment, social protection, education, etc.

Each of these indices covers 11 to 42 indicators, which are accumulated from 26 databases. It should be noted that not all indices are universal, i.e. calculated for all or most countries (according to some indices, there is statistics for less than 20 countries). At the same time, a significant number of indices is the result of public opinion polls, which require special requirements to be representative of this type of research.

One should pay attention to the approach of the American organization The Social Progress Imperative, which calculated the Social Progress Index, which provides for three levels of

assessment - basic human needs, well-being, abilities. There are four components at each level. Each component consists of three to five quantitative indices. The basic human needs are assessed in terms of nutrition and basic health care, access to water and sanitation, living conditions, and personal safety. The principles of welfare are analyzed through access to basic education (primary and secondary), access to information and communication, health and wellness, and environmental quality. Opportunities are assessed through personal rights (political, property rights, self-expression), personal freedom and freedom of choice, tolerance and inclusion, access to higher education.

The social indices, investigated by OECD, provides their grouping in five directions. The first group includes general indices of social status such as household income, fertility, migration, family composition, and elderly care. Indices of employment, unemployment, pension, education expenses form a group of social self-sufficiency indicators. This approach also looks at two common groups of social indices - equality indices (poverty, income inequality, social expenditures and the proportion of people in need of social security) and health (life expectancy and health estimates, health care costs). The last group of indices characterize social binds by such parameters as life satisfaction, tolerance, security and crime, trust in institutions and a willingness to help others.

At the same time, in addition to international approaches to assessing social indices in some countries, national methods for statistical bases of social indices have been developed. In particular, the New York Mayor Office proposes to evaluate social indices in eight areas: education, health and well-being, housing, social empowerment, economic security and mobility, infrastructure and environment, personal and social security, diversity and inclusion. Most of these indices are common to the above approaches, however, at the same time, there are specific

parameters that characterize working conditions, such as staff turnover or time spent for the way to come home; homelessness indices; parameters of the psychological state of the population, etc.

One should pay attention to the statistical base of social indices published by the Ministry of Social Development of New Zealand, which includes 12 groups of social indices that characterize the social status quite broadly. This approach complements a broad set of indices (health, safety, social binds, paid work, economic standards of living and well-being, demographic features, civil and political rights) by highlighting such indices as leisure and recovery, cultural identity, life satisfaction, knowledge and skills.

The analysis shows that it is impossible to concentrate on determining the most important areas when forming the list of social development indices, taking into account the fact that different approaches are characterized by the simultaneous use of similar groups of social parameters in the context of the general methodology construction and the different distribution of similar or alternative individual indices among areas of analysis. Thus, the next stage of the study is to compare the overall list of social indices used in different approaches to identify the most common indices which, on the one hand, would ensure that different features of the social status are taken into account and, on the other hand, would not duplicate each other by nature and provide optimum ratio of the quantity and quality of the information presented. According to the results of this analysis, 30 indices are extracted from the list of social development parameters used by the five surveyed organizations, which are presented simultaneously in two or more methods (Table A.7, Appendix A). It should be noted that some methods offer employment and unemployment at the same time, which is impractical when forming an integral index of

social development through duplication of information. Therefore, one of the indices, namely unemployment, as more widespread, should be used to estimate individual countries.

It should also be noted that the statistics used by different organizations to measure such indices as security and fear of crime are identical, indicating that it is advisable to use only one of the parameters for assessing security perceptions when constructing a composite social development index.

Thus, according to the results of the analysis, a list of 28 social status indices characterizing different aspects of social life in the country has been formed, which, taking into account existing approaches and essential properties of these indicators, can be grouped into eight sections:

- demographic status of the population (fertility, marital status);
- the economic status of the population (unemployment, income disparity, poverty, household access to telephone and Internet, housing availability);
- trust in institutions (voting, corruption)
- gender equality (share of women in government)
- social binds and social activity (tolerance, diversity, volunteer work, cultural and social activity, helping others, discrimination)
- security (security, crime rate, road accidents)
- education (primary education, adult literacy)
- health and psychological status (premature death rate, infant mortality rate, health care costs, life expectancy, psychological risk, self-estimation of the health status, suicide, life satisfaction).

The demographic assessment of the population is presented in the approaches of two organizations, while the other approaches do not consider alternative indices when assessing social development, while all surveyed organizations offer a

number of indices to assess the economic status of the population. At the same time, specific indices of trust in the institutions of three organizations are used. The OECD methodology does not provide for the direct use of the Corruption Perceptions Index, but the section on indices that describes social binds includes a parameter of trust in institutions that is closely linked to perceptions of corruption in society. Indices for assessing education in measuring social development are used by only a fraction of the observed organizations, but the OECD and the International Institute for Social Research include them as features of other components.

This grouping of indices makes the basis to form a set of parameters for assessing social status for Ukraine. It should be noted that according to separate indices in the domestic and foreign bases no statistical information is presented, or data are available only in the context of several periods. Thus, the following sample of social indices was formed for the study (Table A.8, Appendix A), which includes both the most common indicators of social status and individual indices, which were selected to supplement the relevant groups of indices in the absence of statistics on specific indicators defined in international techniques.

Thus, fertility was included to describe the demographic status of the population, reflecting the average number of births in a country per woman, as well as the relative rate of marriage growth per thousand people, which simultaneously takes into account the number of marriages and divorces. The overall unemployment, poverty rate, Gini index as an indicator of the uneven income distribution, the proportion of Internet users were chosen as the parameters of the economic status of the population in the sample for Ukraine. At the same time, national and international statistical bases do not provide relevant statistics to characterize housing affordability.

Indices of trust in institutions and gender equality were formed on the basis of indicators presented in international statistical bases. The Social Relations and Social Activity metric was formed by volunteering and helping others who characterize social ties as a parameter of participation in public organizations as the social activity index. At the same time, only fragmentary statistics are available for Ukraine characterizing tolerance and perceptions of diversity, which did not allow them to be included in the statistical sample of indices.

The safety group was formed by two general indices which describe the crime rates and traffic accidents in Ukraine, given the lack of statistical data on the level of safety and fear of crime by the population's own estimates.

The indices of education were determined at the level of children and adults by the proportion of children of the relevant school age not involved in primary education, as well as by the level of secondary education characterizing adult literacy.

The last group of social indices - health and psychological status - was formed on the basis of international statistical indicators illustrating life expectancy, infant mortality, and health financing. However, according to the parameters illustrating the psychological state of the population, only fragmentary data for individual periods were available, which made it impossible to include them in the sample.

Thus, the established statistical base of indices for assessing the social status of Ukraine has the following form (Table A.9).

In order to avoid missing values of individual indices, the period of 2010-2016 was chosen in the study, the values of all selected indicators are present in national and international statistical databases.

An important aspect to conduct research to build integrated indices for evaluating social and economic phenomena is to analyze the ability of selected indicators to describe a selected

phenomenon. At this stage, it is common to use principal component methods and factor analysis to group indices by subindex. However, in this study, their use is limited by the ratio of the number of variables and the periods of the study (the principal component method assumes that the number of observations exceeds the number of variables, which is impossible given the available statistical base) and the sampling of the study objects (factor analysis is predominantly used on metrics describing multiple objects of homogeneous set).

In this case, it is advisable to calculate the Cronbach's alpha coefficient used to evaluate the internal consistency of the elements in the model and to determine the quality of measurement of the phenomenon under study through the set of indices used for the evaluation. The general formula for calculating the Cronbach's alpha coefficient is:

$$\alpha_c = \left(\frac{N}{N-1}\right)\left(1 - \frac{\sum_{j=1}^{N}\sigma^2(x_j)}{\sigma^2\sum_{j=1}^{N}x_j}\right) \quad (2.2)$$

where x_j – an individual index of the social status assessment, $j=1,2,N$;

$\sum_{j=1}^{N}\sigma^2(x_j)$ – the sum of dispersions of individual indices;

$\sigma^2\sum_{j=1}^{N}x_j$ – the dispersion of the sum of individual indices.

The results of the Cronbach's alpha calculation were performed using the Stata 12 SE software package. The reliability value obtained for non-standardized data is 0.1559, which indicates that the sample is not capable to describe a single phenomenon. At the same time, the calculation of Cronbach's alpha coefficient for standardized data increased its

value to 0.8962, indicating a high level of reliability, as well as a small level of overall correlation of individual indices at the sampling level, proves a sufficient level of its heterogeneity and a small level improving the reliability of the sample by removing individual indices (table 2.5).

Table 2.5. Results of Cronbach's alpha calculation for standardized values of social indices

Social in dices	Cross-group correlation	Cronbach's alpha coefficient when removing a single index
Fertility level	0,3000	0,8852
The difference between the number of marriages and divorces per 1,000 people	0,3766	0,9158
Total unemployment rate,%	0,3161	0,8927
Ginny Index	0,3322	0,8996
Percentage of population living below the national poverty line,%	0,3119	0,8908
Share of Internet users relative to total population,%	0,2846	0,8775
Voting and Accountability	0,3689	0,9132
World Corruption Perceptions Index	0,3007	0,8856
Share of women's participation in national parliament,%	0,2914	0,8810
Percentage of population helping others,%	0,3003	0,8854
Volunteer share of population,%	0,3492	0,9062
Participation in POs per 1,000 people	0,3256	0,8968
The crime rate, the number of offences per 1 thousand people	0,3077	0,8889
Number of traffic accidents per 1,000 people	0,3012	0,8858
Average level of secondary education,%	0,2888	0,8797
Percentage of children not receiving primary education,% to the total number of children of the relevant school age	0,3152	0,8923
Life expectancy in years	0,2859	0,8781

Social in dices	Cross-group correlation	Cronbach's alpha coefficient when removing a single index
Infant mortality rate, in thousands of children under 5 years	0,2849	0,8776
The level of public funding for health care,% of state expenditure in general expences	0,2936	0,8821
Total	0,3123	0,8962

Cronbach's alpha calculations showed the necessity to normalize the data describing the social status in order to form a homogeneous sample. At the same time, the it is appropriate to use data standardization when assessing the social status of individual indices, whereas the purpose of the study involves the construction of an integral index, which necessitates the harmonization of not only the statistical values of individual indices but also the direction of their dynamics in the context of describing social values. Therefore, the next stage of the study is to normalize the input data of social indices using the minimum method. It is based on the division of indices into two groups in accordance with the direction in which they describe the observed phenomenon. Indices the growth of which improves the integral indicator are regarded as stimulus indices, whereas indicators growth of which reflects a deterioration of the integral index are considered as stimulus indices.

The normalized value of indices-stimulators is calculated by the formula of natural normalization:

$$\bar{x}_i = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}}, \qquad (2.3)$$

where x_i = current index,

$x_{\max}$ = maximum index in the sample of data,

$x_{\min}$ = minimum index in the sample of data.

Accordingly, the Savage normalization formula is used to calculate the normalized value for the stimulus indices:

$$\bar{x}_i = \frac{x_{\max} - x_i}{x_{\max} - x_{\min}}, \tag{2.4}$$

The results from grouping social status indices into stimulator and destimulator, the results from applying their values normalization are shown in Table. A.10.

The Cronbach's alpha value for the normalized minimax index values was 0.9263, which proves an increase in the internal consistency of the indices in the sample compared to the results obtained for the non-normalized and standardized data.

The next step to form an integral index is to choose how to aggregate some social indices. In this study, it is advisable to aggregate the data using the weights of the studied indices based on the analytical hierarchy principle and the simply adding weights method, which takes into account the degree of significance of individual indices. According to this algorithm, the first priority ratio of indices between the indicators is first calculated. The sum of the priority ratios of the individual index is related to the total sum of the sample priorities. Thus, the sum of the weights is equal to one. The criterion of significance degree determines the frequency presence of individual social status indices in national and international methods. The algorithm to calculate the weights is shown in Appendix B.

Table A.11 presents the weighting coefficients of the individual indices of social status, their calculated values taking into account the weighing, as well as the data describing the integral social status index calculated by the formula:

$$ISS = \sum_{j=1}^{19} w_j x_j \tag{2.5}$$

where x_j – individual index of the social status, j=[1,19];

w_j –weighting coefficient of j index.

Taking into account the normalization criteria and weighting coefficients, the integral index of social status takes values within [0; 1], and its growth improves social status.

Thus, for the analyzed period it is possible to note a tendency for the gradual improvement of Ukraine's social status, therefore the maximum value of the coefficient was reached in 2016. At the same time, during the study period, it is reasonable to decrease the index for the results of 2015 compared to the previous period. From the data of Fig. 2.2 we will notice the absence of monotone tendencies for most groups of the studied indices. Thus, only the indices characterizing the demographic status of the population show a tendency for constant growth. At the same time, the economic situation of the population reaches its maximum value in 2016, with gradual improvement over 2010-2013 and a deterioration in 2014-2015. In general, during the period under review indices of health, confidence in institutions and gender equality can be noted.

At the same time, the parameters of security, social ties and social activity are characterized by a worsening of the general level in recent years in comparison with the previous periods. Therefore, education indices show the least variation during the observed period.

The investigated scientific and methodological approach made it possible to generalize the methodological provisions and practical recommendations to the assessment of social status in the international practice, as well as to take into account the realities of displaying statistical information describing the social processes development in Ukraine, in domestic and international statistical bases.

The calculated integral social status index for Ukraine provides an aggregation of various aspects of the social phenomena development in the national perspective. It can be used comprehensively to characterize the country's social state as a productive variable, which is directed by the instruments of state regulation of the economy, on the one hand, to evaluate the regulatory measures effectiveness, on the other hand, from the viewpoint of developing effective economic regulation measures aimed at achieving a balanced country's economic, social and political development. The results of changes in the index structure create the basis for adjusting the main directions of social policy in Ukraine.

At the same time, in order to assess the effectiveness of the state regulation instruments on social development, it is advisable to assess the sensitivity of certain areas in the social status to the impact of state regulation indices. In order to perform the assessment, indices from the World Bank's World Governance Indicators database - Government effectiveness Regulatory quality were selected. Using the Price-Winsten method of regression dependencies, the relationship between state regulation and the social status index and its individual components was estimated. The results of the calculations are presented in table 2.6.

Based on the calculation results, we can draw the following conclusions:

– the social status index is characterized by a significant direct dependence on government effectiveness, while the quality of regulation as a whole has a little statistically insignificant impact on the social status;
– indices of demographic status, gender equality and population health are closely linked to the parameters of government effectiveness and quality of regulation at the same time;

– trust in institutions, social binds and social activity depend to a large extent on the quality of government, while the effectiveness of the government has no significant impact on these components in the social status;
– indices of the economic status of the population, security and education do not have statistically significant dependence on indices of state administration quality and effectiveness.

Table 2.6. Results of the evaluation of the effect made by the state regulation indices on the social status index of Ukraine and its components

Indices of social development	Impact coefficients		Parameters of the model appropriateness		
	Government effectiveness	Quality of regulation	F	Prob > F	Correct. R2
Social status index	0,6002* (2,34)	0,0559 (0,09)	11,85	0,0208	0,7834
Demographic status of the population	0,0875*** (13,22)	0,1764*** (9,64)	231,42	0,0001	0,9871
Economic condition of the population	0,1719 (2,01)	0,2417 (1,18)	7,69	0,0426	0,6905
Trust in institutions	0,0416 (1,33)	0,2278** (3,09)	6,19	0,0597	0,6335
Gender equality	0,1976*** (17,17)	0,2279*** (6,99)	191,58	0,0001	0,9845
Social binds and social activity	-0,1475 (-1,47)	-0,5385* (-2,38)	4,80	0,0866	0,5585
Security	0,0122 (0,24)	-0,2596 (-2,04)	10,49	0,0256	0,7599
Education	0,0659 (1,09)	-0,1177 (-0,90)	2,69	0,1822	0,3597
Health	0,1976*** (5,26)	0,2063* (2,14)	31,25	0,0036	0,9098

As a result of the conducted research, we can conclude that the most effective channels of state regulation influence of the economy on the social status of Ukraine are the indices of demographic status, gender equality and population health parameters. The increase of the governance quality lets to make a more effective impact on such sectors of public life such as trust in institutions, social activity and social binds while increasing government effectiveness is an effective way to improve the social condition of the country as a whole.

2.3. Methodological fundamentals for assessing the political situation in the country

The studied state regulation of the economy is inextricably linked to political governance. Public administration is a part of political management aimed at ensuring the protection of citizens' rights and freedoms, socio-economic stability, support for national security, etc.

Since the sphere of state influence is not limited to the management of socio-economic development, it is advisable to consider the political position of society as part of the complex of effective functioning of the state (Geley SD, Rutar, 2001). State regulation of the national economy is inextricably related to political governance since it is the political component that provides stable implementation and timely adoption of any program in the country’s social and economic development. At the same time, it is fair to point out that the political status of society is rather ambiguous in the scientific literature and is not stated in a specific format.

Stability is seen as an absence of a real threat of illegitimate violence or the availability of opportunities in the state that allow it to cope with crises in crisis situations in society; the impossibility of civil wars or other forms of military conflict

(minimum stability); the ability of democratic structures to quickly respond to public interest changings.

Stability is a function of democracy that involves citizens' participation in government through the civil society institutions (democratic stability); stability is seen as a functioning government for a long time; stability in democratic countries is related to the constitutional order; stability is seen as a consequence of the legitimacy of power, as a lack of structural change in the political system, or as the capacity to govern it.

Such destabilizing factors as aggravation of contradictions between the authorities and people; the increase in alienation of power structures from society and increasing distrust of them; dissatisfaction with the regulating policy of the incomes of different population groups, which causes sharp polarization; reducing the people's living standard and unemployment growth; various manifestations of political extremism; low efficiency of national policy, increase of interethnic and inter-regional conflicts; ethno-confessional conflicts; waves of mass migration; the decline of dominant ideology and morality; increase in crime and so on.

The analysis of the political situation by their nature is unique for each country. Some organizations have developed their own approaches to defining it. Given the diversity of approaches and each country's peculiarities, the results of these methods can produce different results. Different approaches require a high level of flexibility in defining the analytical framework and targeting to assess the political situation in the country (table A.12).

The approach offered by USAID is based on an assessment of the state's "fragility" in order to develop more effective strategies, including interventions aimed at the main sources of instability.

The following areas are considered in USAID research to assess the political situation:

- the level of political consensus or support for the existing institutional structure
- the application of the rule of law
- the degree of political pluralism
- the degree of political and social integration
-effectiveness of general management (eg provision of services).

DFID uses a conflict-oriented approach to analyzing the country's political state.

This method is based on the use of a flexible model, which includes the analysis of political agents, authorities and institutions.

Conflict assessments include three steps:

- analysis of the conflict;
- analysis of international reactions to the situation;
- development of conflict resolution strategies in programming and approaches.

The Agency for International Co-operation and Development (SIDA) conducts a multidimensional analysis of poverty at the country level that includes an analysis of the economic, social and political aspects of poverty.

The method she uses seeks to understand the country's political state, including the distribution of formal and informal power between different authorities in the country. It includes an analysis of the institutions and structures that form the capacity to exercise the rights of these entities, with the ultimate goal to overcome poverty. The research examines the scope and incentives to develop the poor, as well as the ability of the poor to ensure accountability of institutions and the usage of the right to vote.

This method takes into account the nature of state power, considers poverty as the powerlessness of the state to influence

this process, the ability of the poor to defend their interests and cooperate with the state for political, social and economic opportunities.

The methodology for determining the political status of the German Development Cooperation Society (BMZ and GIZ) relies on conflict analysis and management questionnaires - a tool for empirical analysis of governance and political economy.

BMZ social and cultural studies include discussions of key social groups, the legitimacy and functioning of state institutions and civil society, and key structural obstacles to its development. The research is finished with recommendations regarding state administration. These studies do not seek to generate new, in-depth knowledge of the problems in the political economy, but merely to trace the basic features of the country's social and political context.

Governance surveys make a tool for analyzing political institutions in the country. The study is conducted in the context of the following questions:

- relations between the state and society;
- political system;
- political culture, causes of change and paradigm of development;
- politics and gender;
- economic policy and political base of markets;
- international integration.

All of these approaches are characterized by a specific focus and a specific goal that is most often based on the peculiarities of each country. However, in determining the socio-political situation in the country, the World Bank made a significant contribution to the development of Worldwide Governance Indices, which take into account the strengths and weaknesses of local institutions.

In this approach, governance indices are presented in six aspects:

- vote and accountability;
- political stability and absence of violence;
- effectiveness of the government;
- quality of regulation;
- rule of law;
- control over corruption.

Vote and Accountability reflect the accessibility of the country's citizens to the elections of their own government, as well as the freedom of speech, the freedom to create public organizations and the availability of independent media in the country.

Political stability and non-violence is a measurement of the probability of political instability and / or politically motivated violence, including terrorism.

Government Effectiveness reflects the perception of the public services quality, the quality of the public service and the degree of its political pressure independence, the quality of government policy making and implementation, the confidence in the government's fulfilment of its obligations.

Quality of regulation reflects the government's ability to form and to implement well-thought policies and rules that allow developing the private sector.

Rule of law reflects the degree of confidence in the public rules, in particular, the quality of contract performance, the quality of property rights, the quality of police and courts, and the probability of crime and violence.

Control over corruption reflects the level of public authority application to gain an improper advantage, including both small and large forms of corruption, as well as "capture" of the state by elites and private interests.

Each of these indices was calculated using more than 30 major data sources. Through this statistical methodology, these data sources have been redistributed and combined into six broad indices.

The authors of the methodology for calculating World Governance Indices note that the six governance indicators should be considered as a set of interrelated government parameters, because of their interdependence. Developing accountability mechanisms reduces corruption. A more efficient government can provide better regulation in the country. The rule of law, in turn, also leads to a reduction in corruption and the formation of equitable processes for the selection and replacement of governments (Kaufmann D., Kraay A., Mastruzzi M., 2010).

Based on these indices, it will be reasonable to calculate an integral index of the political situation in Ukraine.

However, in order to highlight the political component of public administration, it is necessary to exclude the Vote and Accountability index due to its social orientation.

The political situation must be assessed in several stages.

Step 1. Formation of an input set of statistics.

The input to assessing the political situation will be the World Governance Indicators (WGI), which is a consolidated dataset that summarizes the views on the quality of government represented by a large number of respondents: businesses, citizens and experts in most countries of the world. These indices include Political Stability and Absence of Violence (P1), Government Effectiveness (P2), Regulatory Quality (P3), Rule of Law (P4), and Control of Corruption - P5.

Since these aggregated figures have the same dimension from -2.5 (lowest level) to 2.5 (highest level) and do not have missing data, there is no need for preliminary data preparation and standardization. Data for analysis were selected from 2002 to

2016. Figure 2.2 shows the dynamics of selected indices for assessing the political situation of the country.

Figure shows that index P1 (political stability and absence of violence) is mostly changed over the period under review. Thus, from 2007 to 2008 in Ukraine there were positive values of this index (0.17 in 2007, 0.04 in 2008), which corresponded to the period of the relative political stability in the country. After 2012, the index was significantly reduced. It reached its minimum in 2014 and amounted to -2.02 units. During this period there were protests in Kyiv, the annexation of the Crimean peninsula, early presidential elections and the start of an anti-terrorist operation in Donbas. After 2014, that index begins to grow slowly.

Other indices, although they are constantly low, are characterized by relative stability and no fluctuations.

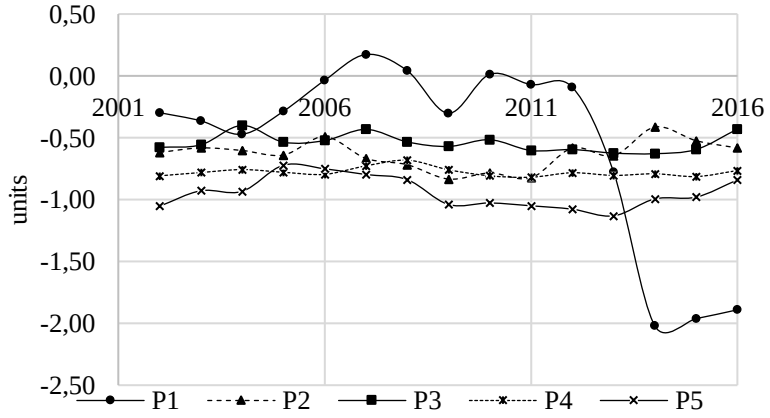


Figure 2.2 – Dynamics of indices for assessment of the political situation in the country

Source: author's investigation

Step 2. The factor analysis using the principal component method to identify hidden factors affecting the political situation in the country.

At the beginning of the factor analysis, there are several factors that influence the political component of public administration. The purpose is to identify the least number of hidden general factors that closely approximate the observed parameters and describe the relationships between them. The factors highlighted in this way are generic since they are related to all signs of political standing and are hypothetical (hidden) and cannot be measured directly. This analysis also let us identify and evaluate the relationships between the selected input indices (Tryfos P., 2001). The statistical package STATISTICA 10 was used for factor analysis.

The classical method to identify the optimal number of factors (the number of principal components) is proposed by Guttmann and Kaiser to accept those factors whose eigenvalues are greater than 1.

Based on the Kaiser criterion analysis (figure 2.3), 2 factors with eigenvalues of 2,147 and 1,579 were identified. It means that only 2 factors explain the variance of more than one variable.

	Фактор.нагрузки (Без вращ.) (Таблица данных1) Выделение: Главные компоненты (Отмечены нагрузки >,700000)	
Перемен.	Фактор 1	**Фактор 2**
Rule of Law	0,804755	-0,025871
Control of Corruption	0,743485	-0,480771
Regulatory Quality	0,804018	-0,235673
Government Effectiveness	-0,246438	-0,882417
Political Stability and Absence of Violence	0,489162	0,716102
Общ.дис.	2,146857	1,578814
Доля общ	0,429371	0,315763

Figure 2.3. Factor loads of political situation

Source: author's investigation

Looking at the factor loadings, we observe that the first factor is the Rule of Law, the Control of Corruption and the Quality of Regulation variables, while the second factor is the Effectiveness of Governance and Political Sustainability and Absence of Violence.

In order to confirm the decision to use two factors in further analysis, we use the scree plot proposed Ketel (figure 2.4). The horizontal axis of this graph shows the number of factors, the vertical eigenvalues, and the points correspond to the percentage of explained variance of the selected factors.

Analysis of the scree plot (figure 2.4) shows that using two factors will provide 74.52% of the eigenvalues, which is sufficient for our purposes.

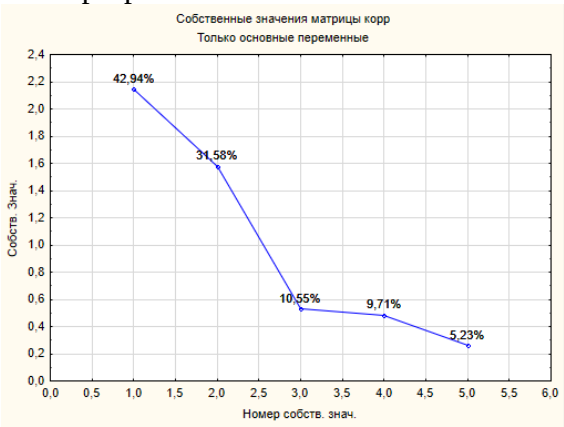


Figure 2.4 – Scree chart
Source: author's investigation

On this basis, all variables are statistically significant and are used for further analysis.

The principal component analysis and classification tool was used to determine the contribution of each variable to the result and the strength of the relationship between them.

An analysis of the correlations between the variables (figure 2.5) revealed a direct moderate relationship between the Rule of Law, Corruption Control and Regulatory Quality, a moderate inverse relationship between Governance Efficiency and Political Sustainability and Absence of Violance. A weak link is traced between the Rule of Law and Governance Effectiveness, Rule of Law and Political Sustainability and Absence of Violence, Corruption Control and Governance Efficiency, Political Sustainability and Absence of Violence, and Effectiveness Management, Quality of Regulation and Efficiency of Management.

In general, correlation analysis shows a close relationship between the variables in the middle of each factor.

	Корреляции (Таблица данных1)				
Переменная	**Rule of Law**	Control of Corruption	Regulatory Quality	Government Effectiveness	Political Stability and Absence of Violence
Rule of Law	1,000000	0,479846	0,494446	-0,163664	0,262293
Control of Corruption	0,479846	1,000000	0,585118	0,234275	0,109987
Regulatory Quality	0,494446	0,585118	1,000000	-0,052077	0,156033
Government Effectiveness	-0,163664	0,234275	-0,052077	1,000000	-0,579009
Political Stability and Absence of Violence	0,262293	0,109987	0,156033	-0,579009	1,000000

Figure 2.5. Correlations of the variables that describe the political situation

Source: author's investigation

	Вклад переменных на основе корреляций (Таблица данных1)	
Переменная	**Фактор 1**	Фактор 2
Rule of Law	0,301665	0,000424
Control of Corruption	0,257479	0,146401
Regulatory Quality	0,301112	0,035179
Government Effectiveness	0,028289	0,493193
Political Stability and Absence of Violence	0,111456	0,324803

Figure 2.6. Contribution of variables based on the correlations of the variables that describe the political situation

Source: author's investigation

Figure 2.6 shows the specific weight of each variable in the future integral index of the political component evaluation in public administration. The Rule of Law variable has the largest contribution - 0.301665, the Regulatory Quality variable - 0.301112, the Corruption Control variable 0.257479, the Political Sustainability and Absence of Violence variable, 0.111456, and Government Effectiveness variable is 0.028289.

In further analysis, these coefficients will serve as weights when constructing the integral index. The generated vector of weights (ω) will have the form:

$$\omega = \{0.111456,\ 0.028289,\ 0.301112,\ 0.301665,\ 0.257479\} \qquad (2.6)$$

Stage 3 Calculation of the effective integral index regarding the political situation assessment.

It is reasonable to construct an integral index when it is necessary to evaluate a complex phenomenon, influenced by many other heterogeneous phenomena, or by the presence of latent relationships between phenomena, which cannot or should not be studied by other methods, based on the goals of the research. It is reasonable to solve the problem of estimating the political component of public administration by the formation of an integral index and bringing it to the scale [-1,1] using a method based on the Minkowski metric .

General view of the method based on the Minkowski metric:

$$I_p = 1 - \sqrt[n]{\sum_{j=1}^{k} \omega_i \cdot \left|1 - \frac{x_{ij}}{x_{maxj}}\right|^n + \sum_{j=k+1}^{n} \omega_i \cdot \left|1 - \frac{x_{minj}}{x_{ij}}\right|^n}, \qquad (2.7)$$

where I_p – an integral index to assess the political component of public administration;

ω_i – weighting coefficient of i-index;

x_{ij} – the relevant value of the i-index for the period of time j;

x_{maxj} – maximum i-index;

n – number of indices.

Given the lack of dectimalators, Model 2.7 is:

$$I_p = 1 - \sqrt[n]{\sum_{j=1}^{n} \omega_i \cdot \left|1 - \frac{x_{ij}}{x_{maxj}}\right|^n} \quad (2.8)$$

We will use this model in the calculations.

Table 2.7. Dynamics of indices for political situation evaluation

Year	Political stability and absence of violence	Government effectiveness	Regulatory quality	Rule of Law	Control of Corruption	Integral index
2002	-0,297	-0,618	-0,577	-0,808	-1,053	-0,31
2003	-0,363	-0,582	-0,557	-0,781	-0,928	-0,29
2004	-0,472	-0,603	-0,400	-0,757	-0,933	-0,28
2005	-0,286	-0,640	-0,535	-0,779	-0,722	-0,26
2006	-0,036	-0,491	-0,523	-0,796	-0,751	-0,26
2007	0,173	-0,667	-0,432	-0,727	-0,797	-0,24
2008	0,042	-0,718	-0,534	-0,681	-0,838	-0,25
2009	-0,302	-0,834	-0,570	-0,759	-1,039	-0,30
2010	0,013	-0,785	-0,516	-0,808	-1,027	-0,30
2011	-0,070	-0,824	-0,603	-0,819	-1,050	-0,31
2012	-0,092	-0,583	-0,595	-0,783	-1,077	-0,31
2013	-0,777	-0,646	-0,624	-0,804	-1,132	-0,34
2014	-2,021	-0,413	-0,629	-0,791	-0,994	-0,42
2015	-1,962	-0,524	-0,595	-0,814	-0,980	-0,41
2016	-1,891	-0,583	-0,430	-0,765	-0,841	-0,37

A graphical interpretation of the integral index of a political situation assessment is presented in Figure 2.7.

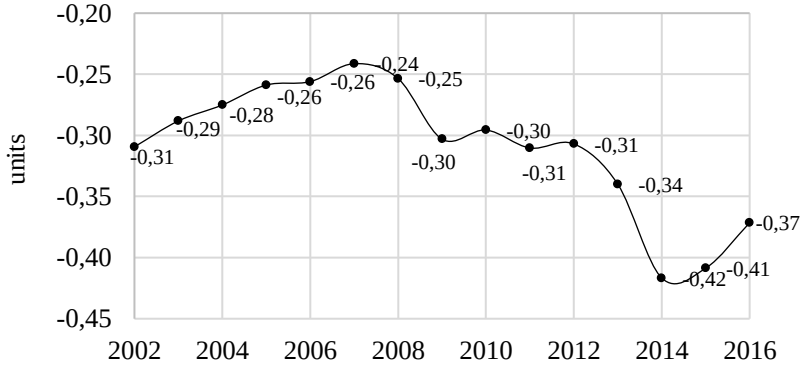


Figure 2.7. Dynamics of the integral index of political situation assessment

The obtained estimate of the political situation is subjective and the values obtained from the calculations can be compared only with their boundary limits [-1; 1] and with the previous values of the estimation. It is reasonable to use a verbal-numeric scale to find the qualitative level of the assessment. The main feature of this scale is that it is possible to define the intensity degree of the calculated assessment of the political component in the public administration. The verbal-numeric scale includes a verbal description of the selected gradations and their corresponding numerical values. The most famous verbal-numeric scale is the Harrington scale.

In order to give a qualitative interpretation of the integral index regarding the assessment of the political component of public administration, it is necessary to modify the Harrington scale by adding several intermediate levels to it.

This integral index will be conveniently interpreted using a qualitative scale. For qualitative display of the index in the range

from -1 to 1 in 0.25 steps, it is reasonable to use the scale given in table 2.8.

Table 2.8. Qualitative scale for assessing the political state

Upper bound	Lower bound межа	Levels of index
1,00	0,75	Stable
0,75	0,50	Very high
0,50	0,25	High
0,25	0,00	Satisfactory
0,00	-0,25	Unsatisfactory
-0,25	-0,50	Low
-0,50	-0,75	Very low
-0,75	-1,00	Critical

Based on this scale, we will compare the quantitative values of the integral index with their qualitative matches. The results are shown in table 2.9.

Table 2.9. Comparison of quantitative values of the integral index of political situation assessment with qualitative correspondences

Year	Integral index	Qualitative index
2002	-0,31	Low
2003	-0,29	Low
2004	-0,28	Low
2005	-0,26	Low
2006	-0,26	Low
2007	-0,24	Unsatisfactory
2008	-0,25	Low
2009	-0,30	Low
2010	-0,30	Low
2011	-0,31	Low
2012	-0,31	Low
2013	-0,34	Low
2014	-0,42	Low
2015	-0,41	Low
2016	-0,37	Low

During the observed period, the political situation level in Ukraine is low. Moreover, since 2007 this level has been steadily declining. Having reached its low of -0.42 in 2014, the political situation has been stabilized and has a positive upward trend.

Since the political situation is the basis for healthy functioning of the state, the turmoil affecting all spheres of activity in the country, the state regulation of the economy cannot neglect the low level of the political situation in Ukraine.

2.4. The scientific and methodological approach to evaluate the integral index of socio-economic and political status

The formation of an integral index for assessing the socio-economic and political state of the national economy becomes relevant, and the state regulation fragments must take into account the interrelation of the three components and determine the appropriate state instruments of influence, depending on the synergetic impact which they have.

Thus, let us consider a step-by-step mechanism to form an integral index for assessing socio-economic and political status.

Stage 1 Systematization of the calculated data features of socio-economic and political status by directions (table 2.10).

It is fair to note that the dynamics of these indices is cyclical, but the waves of each of them do not correspond to the waves of each other. It proves a shift in the trends of state regulation of the national economy in each year and the predominance of the successful transformation of one component over the other and vice versa.

Stage 2. To bring generalized indices of the socio-economic and political status - the index of social status assessment, the index of political component assessment, the index of economic component assessment to a comparative form. It is reasonable to carry out this stage due to the different nature of these indices, different intervals of their values variation (for social and

economic from zero to one, for politically from minus one to one), as well as the inability to reduce them to a single integral index in explicit form.

Table 2.10. The input calculation data to describe the socio-economic and political status by directions

Year	Index		
	Index of social status assessment	Index of political component assessment	Index of the economic component assessment
2002		-0,309	0,417
2003		-0,288	0,453
2004		-0,275	0,531
2005		-0,259	0,394
2006		-0,256	0,201
2007		-0,241	0,212
2008		-0,253	0,184
2009		-0,303	0,149
2010	0,250	-0,296	0,178
2011	0,520	-0,310	0,180
2012	0,560	-0,307	0,144
2013	0,570	-0,340	0,132
2014	0,590	-0,417	0,108
2015	0,560	-0,409	0,129
2016	0,640	-0,371	0,155
2017	0,779	-0,424	0,211
2018	0,904	-0,440	0,196

Thus, moving to the normalization of the input calculated values of the social status assessment index, we note that the nature of this index is stimulating, which is why it is proposed to use a natural approach. In addition, in order to avoid zero values of the normalized index, there is a need to adjust the maximum and minimum values by the mean square deviation (for the minimum value decrease by the value of the mean square deviation, for the maximum value - respectively increase by the given corrective measure):

$$\widetilde{IS}_i = \left| \frac{IS_i - \min\limits_i\{IS_i\} - \sigma_{IS}}{\max\limits_i\{IS_i\} - \min\limits_i\{IS_i\} + 2 \cdot \sigma_{IS}} \right| \quad (2.9)$$

where $\widetilde{IS}_i$ – normalized values of the index for the social state assessment during i-year;

IS_i – the input computed values of the index for social status assessment for the i-year;

$\min\limits_i\{IS_i\}$ - the minimum value of the social status assessment index over the considered period;

σ_{IS} – the average square deviation of the index for social status assessment over the considered period;

$\max\limits_i\{IS_i\}$ - the maximum value of the index for social status assessment index over the considered period.

Moving to the normalization of the index for a political component evaluation, let us mention its stimulating nature, which leads to the expediency of applying a natural approach, similar to the index of social status:

$$\widetilde{IP}_i = \frac{IP_i - \min\limits_i\{IP_i\}}{\max\limits_i\{IP_i\} - \min\limits_i\{IP_i\}} \quad (2.10)$$

where $\widetilde{IP}_i$ – normalized values of the index for political component assessment over i-year;

IP_i – input calculated values of the index for political component assessment over i-year;

$\min\limits_i\{IP_i\}$, $\max\limits_i\{IP_i\}$- the minimum and maximum value of the index for political component evaluation over the considered period.

At the same time, if $\min\limits_i\{IP_i\} = -1$, $\max\limits_i\{IP_i\} = 1$, formula (2.10) is:

$$\widetilde{IP}_i = \frac{IP_i + 1}{2} \tag{2.11}$$

Moving to the normalization of the index for the economic component evaluation, we use the same approach that was used in the case of the social component index:

$$\widetilde{IE}_i = \left| \frac{IE_i - \min\limits_i\{IE_i\} - \sigma_{IE}}{\max\limits_i\{IE_i\} - \min\limits_i\{IE_i\} + 2 \cdot \sigma_{IE}} \right| \tag{2.12}$$

where $\widetilde{IE}_i$– normalized values of the index for economic component assessment over the i-year;

IE_i – input calculated values of the index for the economic component evaluation over the i-year;

$\min\limits_i\{IE_i\}$, $\max\limits_i\{IE_i\}$- the minimum and maximum value of the index for economic component evaluation over the considered period.

σ_{IE} – the average square deviation of the index for the economic component evaluation over the considered period of time.

The results of calculations by formulas (2.9), (2.10), (2.11) are given in table 2.11.

It should be noted that the trends of the political and social component of the national economy have changed in the leading positions since 2016, so the social component began to outweigh the political one. There is a negative fact that the trend of the economic component is minimal among the three components.

During nine years the economic component did not exceed the normalized value of 0.24 units. This is quite consistent with the current situation in the economy of Ukraine during 2010-2018 when GDP growth rate did not exceed 5%, the number of foreign exchange reserves was at a critical level, and the UAH exchange rate increased three times against the US dollar.

Table 2.11. Normalized values regarding the features of socio-economic and political status in the areas

Year	Index		
	Index of the social state assessment	Index of the political component assessment	Index of the economic component assessment
2002		0,345	0,245
2003		0,356	0,297
2004		0,362	0,409
2005		0,371	0,213
2006		0,372	0,064
2007		0,379	0,048
2008		0,373	0,087
2009		0,348	0,139
2010	0,198	0,352	0,097
2011	0,221	0,345	0,094
2012	0,283	0,347	0,146
2013	0,298	0,330	0,163
2014	0,329	0,292	0,197
2015	0,283	0,296	0,166
2016	0,407	0,314	0,130
2017	0,291	0,288	0,222
2018	0,405	0,280	0,236

Stage 3 Formation of an integral index for socio-economic and political status estimation by applying the geometric approach. The reasonability to choose this approach is proved to the clarity of the presentation of the results, which is especially relevant when solving sufficiently complex economic problems. In addition, the geometric method is a viable alternative tool to solve these problems, since it is based on the methods and results of solving previous similar problems, and also uses the geometry method, associated with geometric objects, their changes, but does not go beyond these objects.

Determination of the integral index for socio-economic and political status assessment as a generalization of the social status

assessment index, index of political component evaluation, index of economic component evaluation. As an integral index for socio-economic and political status assessment, it is proposed to consider the centroid of the triangle, the sides of which are the normalized values of the index for assessment of the social status, the index of the political component evaluation, the index of the economic component evaluation. Since the centroid of a triangle (its center of mass) can be formed quantitatively only by means of the circle described around a given triangle. Therefore, we consider the radius of the circle described around a given triangle as a quantitative estimate of the socio-economic and political condition index.

$$R_i = \frac{\tilde{IS}_i \cdot \tilde{IP}_i \cdot \tilde{IE}_i}{\sqrt{(\tilde{IS}_i + \tilde{IP}_i + \tilde{IE}_i)(-\tilde{IS}_i + \tilde{IP}_i + \tilde{IE}_i)(\tilde{IS}_i - \tilde{IP}_i + \tilde{IE}_i)(\tilde{IS}_i + \tilde{IP}_i - \tilde{IE}_i)}} \quad (2.13)$$

where R_i - the radius of the circle described around the triangle, the sides of which are the normalized values of the index for the social status assessment, the index of the political component evaluation, the index of the economic component evaluation for the i-year.

The larger the radius of the described circle, the farther the vertices of the triangle from the centroid are, the greater the volatility and the less stable the socio-economic and political state. At the same time, the smaller the value of R_i is, the denser the vertices of the triangle are located about the centre of mass and the more stable the socio-economic-political state will be. In addition, one should pay attention to the extreme case, ie. a situation where, on the basis of the normalized values of the social status assessment index, the political component evaluation index, the economic component evaluation index, it is impossible to construct a triangle, which indicates a rather unstable position. In those cases where we can construct a

triangle, there are two variants: the triangle is acute-angled and the centroid lies in its middle - this indicates a stable socio-economic and political state; the triangle is obtuse, as a result of the fact that mass is located outside the triangle and it indicates an unstable socio-economic and political state. The described pattern can be formalized quantitatively by defining the angles of the corresponding triangles α_IP, α_IS, α_IE (in the case of angles greater than 90 degrees, the angle value is calculated as 180 degrees minus the actual value of the obtuse angle), with subsequent determination of their sum as an index of stability or instability status:

$$ST_i = \alpha_{IP\text{i}} + \alpha_{IS\text{i}} + \alpha_{IE\text{i}} \qquad (2.14)$$
$$\alpha_{IP\text{i}} = \frac{\overline{IP}_i}{2 \cdot sinR_i}, \alpha_{IS\text{i}} = \frac{\overline{IS}_i}{2 \cdot sinR_i}, \alpha_{IE\text{i}} = \frac{\overline{IE}_i}{2 \cdot sinR_i},$$

where ST_i – indicator of stability (instability) of socio-economic and political status for the i-year. This index shows a stable socio-economic and political state $ST_i = 180$ and, accordingly, unstable if $ST_i < 180$;

$\alpha_{IP\text{i}}$ – the angle of the triangle, the sides of which are the normalized values of the index for assessment of the social status, the index of the political component evaluation, the index of the economic component evaluation that lies opposite the index of the political component evaluation for the i-year;

$\alpha_{IS\text{i}}$ - the angle of the triangle opposite the index of the political component evaluation for the i-year;

$\alpha_{IE\text{i}}$ - the angle of the triangle that lies opposite the index of the economic component evaluation for the i-year.

The results of the calculations according to formulas (2.13) and (2.14) are shown in table 2.12.

Table 2.12. The calculations results of the integral index for estimation of the socio-economic and political state, its components and derivatives

Index	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
The political component	0,4	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Economic component	0,1	0,1	0,1	0,2	0,2	0,2	0,1	0,2	0,2
The social component	0,2	0,2	0,3	0,3	0,3	0,3	0,4	0,4	0,4
R radius of the described circle	#NUM	#NUM	0,2	0,2	0,2	0,2	0,3	0,2	0,2
a1 (angle in radians)	#NUM	#NUM	1,0	1,0	0,9	1,0	0,6	0,7	0,7
a2 (angle in radians)	#NUM	#NUM	0,4	0,5	0,6	0,5	0,3	0,5	0,6
a3 (angle in radians)	#NUM	#NUM	0,8	0,9	1,0	0,9	0,8	1,0	1,0
a1 (angle in degrees)	#NUM	#NUM	76,8	86,1	61,3	77,6	37,7	43,7	42,4
a2 (angle in degrees)	#NUM	#NUM	24,1	29,5	36,3	33,3	14,7	32,2	34,7
a3 (angle in degrees)	#NUM	#NUM	52,6	64,5	82,4	69,1	52,4	75,9	77,1
sum of angles	#NUM	#NUM	153,6	180,0	180,0	180,0	104,8	151,7	154,3

#NUM – estimated values are absent since in these cases it is impossible to construct a triangle of socio-economic and political state (one side exceeds the sum of the other two), which is an extreme instability

Source: author's investigation

Stage 4 Prediction of the index for social status assessment, index of political component evaluation, index of economic component evaluation and as a result the integral index of the socio-economic and political state assessment.

4.1 Prediction of the political component estimation index by constructing a nonlinear multiple regression equation by the least-squares method. The nonlinear models are used due to the

complex nature of the systems under consideration, the presence of interdependence of their components, which is very difficult to formalize in a linear form, taking into account the requirement of 5% deviation of actual and predicted values, which is generally accepted in the economy. At the same time, the reasonability to choose multiple regression dependencies is conditioned by the presence of considerable variation of time series, the possibility to detect regularities only on average for the investigated objects, and not in each case, and as a consequence to obtain generalizing features. Thus, considering the index of the political component evaluation as an effective feature, index of the year (1 for 2002, 2 for 2003, etc.), its square, logarithm, sine, cosine, exponential and hyperbolic dependence on four statistically significant factors as a factor features, four factors were selected based on the statistically significant Student's criterion.

Based on the data of Table 2.13 using the Data Analysis tool, Regression a nonlinear multiple regression equation is constructed, according to which 85.58% of the variation of the resulting feature is explained by the selected factor, which indicates the high quality of the model and its adequacy. In addition, moving to the analysis of the next criterion for the validity and significance of model - the Fisher criterion, we note that it exceeds its actual level of 14.83 above the critically acceptable level almost three times.

The predicted values, calculated by the formula (2.15) are demonstrated in table 2.13. Based on the data shown in table 2.13, we note a negative outlook for the political component assessment index of the national economy, which corresponds not only to the current situation in the government and parliament but also to the deterioration of the situation among political parties and government in the two years before the elections.

$$IP_x = -0.2932 - 0.0146 \cdot x - 0.0004 \cdot x^2 + 0.0724 \cdot lnx - 0.0101 \cdot sinx \quad (2.15)$$

where IP_x - political component evaluation index;

x – index of the year.

Table 2.13. Input data for constructing a nonlinear multiple regression equation of the political component evaluation index

Year	Index					
	Index of the political component assessment	X	x^2	lnx	sinx	Forecast
2002	-0,309	1,000	1,000	0,000	0,841	-0,317
2003	-0,288	2,000	4,000	0,693	0,909	-0,283
2004	-0,275	3,000	9,000	1,099	0,141	-0,262
2005	-0,259	4,000	16,000	1,386	-0,757	-0,250
2006	-0,256	5,000	25,000	1,609	-0,959	-0,250
2007	-0,241	6,000	36,000	1,792	-0,279	-0,262
2008	-0,253	7,000	49,000	1,946	0,657	-0,280
2009	-0,303	8,000	64,000	2,079	0,989	-0,294
2010	-0,296	9,000	81,000	2,197	0,412	-0,301
2011	-0,310	10,000	100,000	2,303	-0,544	-0,306
2012	-0,307	11,000	121,000	2,398	-1,000	-0,318
2013	-0,340	12,000	144,000	2,485	-0,537	-0,340
2014	-0,417	13,000	169,000	2,565	0,420	-0,368
2015	-0,409	14,000	196,000	2,639	0,991	-0,393
2016	-0,371	15,000	225,000	2,708	0,650	-0,411
2017		16,000	256,000	2,773	-0,288	-0,424
2018		17,000	289,000	2,833	-0,961	-0,440
2019		18,000	324,000	2,890	-0,751	-0,466
2020		19,000	361,000	2,944	0,150	-0,501
2021		20,000	400,000	2,996	0,913	0,408
2022		21,000	441,000	3,045	0,837	-0,548

4.2 Prediction of the economic component evaluation index.

Table 2.15. Input data for constructing a nonlinear multiple regression equation of the economic component estimation index

Year	Index				
	Index of the economic component assessment	x	x^2	Cos	Forecast
2002	0,417	1,000	1,000	0,540	0,465
2003	0,453	2,000	4,000	-0,416	0,456
2004	0,531	3,000	9,000	-0,990	0,432
2005	0,394	4,000	16,000	-0,654	0,365
2006	0,201	5,000	25,000	0,284	0,270
2007	0,212	6,000	36,000	0,960	0,195
2008	0,184	7,000	49,000	0,754	0,173
2009	0,149	8,000	64,000	-0,146	0,194
2010	0,178	9,000	81,000	-0,911	0,213
2011	0,180	10,000	100,000	-0,839	0,192
2012	0,144	11,000	121,000	0,004	0,135
2013	0,132	12,000	144,000	0,844	0,084
2014	0,108	13,000	169,000	0,907	0,080
2015	0,129	14,000	196,000	0,137	0,127
2016	0,155	15,000	225,000	-0,760	0,185
2017		16,000	256,000	-0,958	0,211
2018		17,000	289,000	-0,275	0,196
2019		18,000	324,000	0,660	0,172
2020		19,000	361,000	0,989	0,187
2021		20,000	400,000	0,408	0,255
2022		21,000	441,000	-0,548	0,350

$$IE_x = 0.5596 - 0.0684 \cdot x + 0.0027 \cdot x^2 - 0.0538 \cdot cosx \qquad (2.16)$$

where IE_x – Index for estimation of the economic component.

The adequacy of the econometric model (2.16) is provided primarily by the obtained value of the determination coefficient at the level of 90.25%, confirming a significant degree of the resulting feature variation under the influence of factor ones; the

actual value of the Fisher test 33, 92, which is almost 6 times higher than the allowable level; statistically significant parameters of the specified equation, as evidenced by both the Student test and confidence limits, which do not contain zero values.

It is fair to point out that the prediction of the economic component confirms its cyclical trend continuation and fall in 2018 after some increase in 2017.

4.3 Prediction of the social status assessment index.

Table 2.16. Input data for constructing a nonlinear multiple regression equation of the social status estimation index

Year	Index				
	Index for the social state evaluation	x	x^2	cos	Forecast
2010	0,250	1,000	1,000	0,540	0,283
2011	0,520	2,000	4,000	-0,416	0,451
2012	0,560	3,000	9,000	-0,990	0,577
2013	0,570	4,000	16,000	-0,654	0,607
2014	0,590	5,000	25,000	0,284	0,573
2015	0,560	6,000	36,000	0,960	0,562
2016	0,640	7,000	49,000	0,754	0,637
2017		8,000	64,000	-0,146	0,779
2018		9,000	81,000	-0,911	0,904
2019		10,000	100,000	-0,839	0,940
2020		11,000	121,000	0,004	0,895
2021		12,000	144,000	0,844	0,847
2022		13,000	169,000	0,907	0,874

$$IE_x = 0.2631 - 0.0763 \cdot x - 0.0017 \cdot x^2 - 0.1015 \cdot cosx \quad (2.17)$$

where IE_x – Index of the social state assessment.

Based on the data of Table 2.16, a nonlinear multiple regression equation (2.17) is constructed. According to it, 91.99% (coefficient of determination) of the variation of the social status estimation index is explained by a time factor, which indicates the high quality of the model and its adequacy.

In addition, moving on to the analysis of the next criterion for the validity and significance of the model - the Fisher criterion, we note that it exceeds its actual level of 11.49 above the critically acceptable level almost twice.

It should be noted that only the social component evaluation index showed an increase in the forecast period. However, it should be mentioned that this growth is populist in nature, not economically justified, since the economic index is not growing, and the positive trend of the social index is due to the authorities' efforts to form positive expectations and reaction of their electorate before the elections.

4.4 Predicting Actual Values of the Social Status Assessment Index, the Political Component Assessment Index, the Economic Component Assessment Index, and the subsequent calculation of normative forecast values for the period 2019 to 2022. Using econometric models (2.15), (2.16), (2.17), let us calculate these predictions of actual index levels. Taking into account the above normalization formulas (2.9), (2.11), (2.12), we calculate the predictive normative levels of the socio-economic-political status indices.

4.5. Predicting the integral index of socio-economic-political status and its stability based on the radius of the circle, described around a triangle, the sides of which are the normalized values of the the social status assessment index, the index of the political component evaluation, the index of economic component evaluation, as well as the sum of the angels. Formulas (2.14) and (2.15), respectively, are used to implement this step.

Table 2.17. Actual and normalized forecast values of the social status assessment index, the political component evaluation index, the economic component evaluation index

Year	Actual values			Normalized values		
	Index of social status assessment	Index of political component assessment	Index of economic component assessment	Index of social status assessment	Index of political component assessment	Index of economic component assessment
2019	0,940	-0,466	0,172	0,438	0,267	0,258
2020	0,895	-0,501	0,187	0,397	0,250	0,245
2021	0,847	-0,535	0,255	0,353	0,233	0,183
2022	0,874	-0,561	0,350	0,378	0,219	0,201

Thus, one should conclude that after 2019 the integral index of the socio-economic and political state of the national economy will decrease, which is quite logical given the presidential and parliamentary elections in Ukraine, on the eve of which the authorities tried to improve all areas of activity. The next two years 2020-2021 will see a worsening trend in Ukraine's socio-economic and political situation, and only in 2023, the significant positive synergistic changes in the country will take place.

3. PRIORITY COURSES OF THE NATIONAL ECONOMY DEVELOPMENT ACCORDING TO THE INCLUSIVITY PRINCIPLES

3.1 Formation of economic development regulation policy

In order to implement inclusive growth policy, it is necessary to coordinate structural and macroeconomic policy, in particular through the combination of budgetary funds and private capital through the implementation of social impact investments, stimulating investment in human development (education, infrastructure, etc.). Education development is one of the priorities, as research findings indicate that the problem of education access is a significant inequality factor.

Thus, the analysis for 31 OECD countries confirms that the inability of the poorest sections of the population to provide quality education for their children is one of the main factors influencing the increase in income inequality and slowing productivity growth. Today, it is about increasing the so-called digital inequality (lack of skills in operating in a digital technology environment). While in 2014, 95% of adults in Denmark, Iceland, Luxembourg and Norway had Internet access, in Mexico, less than half do. In addition, in developed countries, 55% of the workforce is experiencing serious difficulties in realizing their employment opportunities provided by the digital economy of the OECD (2016a).

In this context, attention is paid on increasing productivity and equal opportunities. The structural, macroeconomic and financial, as well as international cooperation policies, are designed to implement reforms to ensure inclusive growth while contributing to qualitative job creation and equity (OECD 2018a). As reported in the Reporting Documents (OECD, 2016a), "The complexity of implementing inclusive growth poses important governance challenges, since policy

fragmentation must be reduced and institutional mechanisms must be integrated to develop coherent policy packages and implement them more effectively."

Therefore, we define the research tasks, based on this idea: 1) Institutional strength is important for inclusive growth - the institutional component of certain areas provides a certain quality of growth through compliance with living standards 2) factors that lead to the achievement of inclusive results of growth and development of the national economy are not clearly defined.

The absence of a sound evidence base makes the decision-makers of the national economy, in particular, the social sector, unable to assess the impact of the decisions. In turn, it does not let to increase growth rates and create inclusive benefits, especially in conditions of low labour productivity, which is peculiar for the Ukrainian economy. Therefore, in the absence of a high-quality institutional environment in the context of globalization, technological and information changes, it is difficult to achieve not only the inclusive growth but to ensure positive sustainable rates, financial stability, reduce economic and social inequality.

However, one of the basic contradictions that emerge in the implementation process of inclusive growth policy is the contradiction of dimension. Its essence is that despite declaring a wide range of factors that represent growth, the main GDP index is the main indicator of the national accounts system - GDP, which only reflects the aggregate number of goods, works and services produced in the national economy. However, if growth is identified at the level of individual citizens or households, the estimates are clearly shifted to a living standard, including income, employment, security, and quality of life.

Another contradiction is the proactive nature of the development n comparison with the regulatory action, which is

driven by technological development, demographic problems, globalization.

One should also point out contradictions between market and state methods of influence, the question is whether market mechanisms can be created to expand social participation in a new environment? Should there be a social impact system?

These contradictions require a thorough study, which should be a social "adjustment" of the current economic growth model (social) correction in the present economic growth model to counteract the described challenges.

Policy-making should clearly identify the features of inclusive growth as a development strategy, in particular:

1. Close interconnection of all areas and elements in the development policy, i.e inclusive growth is achieved through a combination of economic, social, environmental, and institutional factors.

2. The focus of changing approaches to shaping the economic growth model is inequality - the economic instability observed in many countries is caused by income inequality, which is growing faster than private equity.

3. Priority to deploy the institutional component especially the social sector institutions. Research findings confirm the significant impact of institutions on economic growth.

Therefore, the institutional environment should become the main object of regulatory influence, because it is the quality of institutions that causes inequality in its various manifestations. These issues cannot be solved without appropriate institutional changes in each country's economy.

3.2. Theoretical and methodological foundations to explain the priorities of the social sector development in the national economy

In order to substantiate the state regulation priorities of social sector development, we will evaluate the relative efficiency of state regulation of the social sector, which will be implemented on the basis of the DEA-analysis (Data Envelopment Analysis). This analysis relates to non-parametric methods, ie it does not involve finding and functionally linking the inputs used to produce outputs. The DEA analysis does not consider the priority or difference in the importance of the resources involved and, accordingly, the differentiation of weights in the indicators. The results obtained are also considered equal in importance. Comparing the ratio of resources and outcomes of one country (DMU - Decision Making Unit) to that of another country or group of countries, one can calculate the relative efficiency to manage each of them. As a result, there will be an assessment of the relative, unconditional and integral effectiveness of government regulation of the social sector development, which ranges from 0 to 1. Countries with a value of 1 are considered effective in governance, and countries that receive a value of relative efficiency of less than 1 do not fully implement the existing resource potential of the system. The ability to generate an information base to formulate recommendations for improving management effectiveness and setting their priorities is very valuable in using the DEA analysis method.

This analysis can be performed in two models. The first model is oriented to results (input-oriented model), provides for the evaluation of efficiency by minimizing the resources involved at a given constant result. This model was formed in 1978 and is called CCR, as the first letters of its designers Charnes, A.et. al. names (1978).

In order to solve goals in our research, we will use an output-oriented model, that is, to maximize the institutional quality of the social sector in the national economy at a given level of the social sector institutions quality, which acts as a resource in our model.

In general, the CCR model is based on the concept of continuous return and provides an estimate of the relative efficiency n DMUs in converting m resources into s results:

$$h_k = \frac{\sum_{r=1}^{s} U_r Y_{rk}}{\sum_{i=1}^{m} V_i X_{ik}} \rightarrow max \tag{3.1}$$

if

$$\begin{cases} \frac{\sum_{r=1}^{s} U_r Y_{rj}}{\sum_{i=1}^{m} V_i X_{ij}} \leq 1; \ j = 1,2, \dots, n \\ U_r, V_i > 0; r = 1,2, \dots, s; i = 1,2, \dots, m \end{cases} \tag{3.2}$$

where h_k – the relative efficiency of *k* DMU;

Y_{rj}- *r*-result of j DMU;

X_{ij} – *i*- the resource of j DMU;

U_r, - weighting coefficient with *r*-result;

V_i – weighting coefficient with i-resource (Lin, Lie-Chien & Tseng, Lih-An., 2005).

According to the model, the relative efficiency is determined by the maximum value obtained by the ratio of the weighted results to the weighted used resources. Since this equation is a linear programming task, a twofold task can be constructed to it, which minimizes the weighted values of resources at a fixed value of the obtained result. (Porunov, 2016).

$$h_k = \theta - \ \varepsilon[\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^- \ ] \rightarrow min \tag{3.3}$$

if

$$\sum_{j=1}^{n} \lambda_j X_{ij} + s_i^- \le \theta X_{ij}$$
$$\sum_{j=1}^{n} \lambda_j Y_{rj} - s_r^+ \ge Y_{rj}$$
$$\lambda_j \ge 0, s_r^+, s_i^- \ge \varepsilon \ge 0;\ \forall\, i, r, j$$
$$r = 1,2,\dots,s;\ i = 1,2,\dots,m; j = 1,2,\dots,n$$

where λ_j – weighting coefficient of j DMU;
s_r^+, - the feature of the potential improvement for *r*-result;
s_i^- - the feature of the potential improvement for *i*-resource.

Graphically, the CCR result-oriented model is presented in figure 3.1

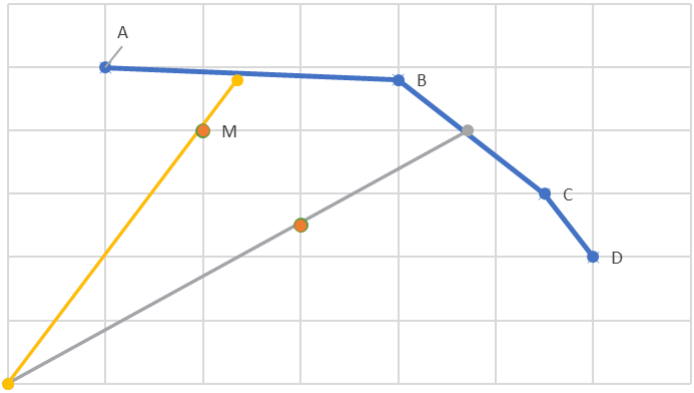


Figure 3.1.Graphical representation of DEA-analysis
Source: formed by the author

Points A, B, C, D describe the efficiency of the countries' public administration that maximize the results of Y1 and Y2 at a given value of resource H. It creates a so-called "efficiency boundary" that will be maximum for each point on this curve.

Countries M and L are within the established boundary of efficiency and, accordingly, exhibit relative inefficiency.

The additional benefits of DEA analysis include, first, the ability to recommend action to reach the efficiency boundary by setting specific absolute values of change to the inefficient countries governments and, second, to identify benchmarks for which effective change can be ensured. So, countries A and B will be the benchmarks for M, and the M-M1 segment is a targeted quantification of the changes required to achieve relative government efficiency. Similarly, segment L-L1 is a target characteristic of increasing the government regulation efficiency for country L. In this case, it is advisable for the L government to use the experience of countries B and C.

Therefore, in order to evaluate the relative efficiency of the state regulation regarding the social sector of the national economy, we will form a result-oriented CCR model, based on the features of the institutional quality in the social sector of the national economy (QISS), which will determine the model's resource parameters. Social capital indices (SCI), social infrastructure index (SII) and social security index (SSI) characterize the development of three dimensions of informal social sector institutions. Given the fact that government regulation of the social sector must be aimed at the harmonious development of these components, taking into account existing international experience, the value of these indices will be considered as quantitative results of the model.

Therefore, Table 3.1 shows the inputs for calculating the relative efficiency of state regulation of the social sector. In the process of analysis, we will additionally look for answers to the question of whether the level of economic development and the type of basic institutions formation (revolutionary or evolutionary) affect the country's ranking in the relative efficiency of state regulation of the social sector.

Table 3.1. Inputs to form the model

Countries	Group of countries	Type of institutions formation	Institutional Quality Indexof Social Sector of National Economy (QISS)	Social Capital Index (SCI)	Social Infrastructure Index (SII)	SocialSecurity Index (SSI)
Armenia	4	revolut.	4,351	0,571	0,316	0,210
Austria	2	evolut.	6,361	0,638	0,550	0,807
Belgium	2	evolut.	6,091	0,643	0,401	0,799
Denmark	2	evolut.	5,549	0,696	0,577	0,912
Estonia	3	revolut.	5,129	0,623	0,453	0,791
Finland	2	evolut.	5,986	0,697	0,590	0,853
France	1	evolut.	6,394	0,646	0,420	0,852
Georgia	4	revolut.	3,562	0,547	0,472	0,164
Germany	1	evolut.	6,329	0,657	0,529	0,870
Italy	1	evolut.	5,469	0,633	0,853	0,727
Latvia	3	revolut.	4,478	0,598	0,515	0,696
Lithuania	3	revolut.	4,743	0,600	0,586	0,678
Netherlands	2	evolut.	6,093	0,659	0,429	0,824
Portugal	2	evolut.	4,332	0,629	0,480	0,651
Romania	3	revolut.	3,780	0,567	0,184	0,481
Russian Federation	4	revolut.	4,804	0,551	0,233	0,619
Sweden	2	evolut.	6,281	0,705	0,557	0,908
Turkey	2	evolut.	2,483	0,529	0,315	0,498
Ukraine	4	revolut.	4,696	0,571	0,210	0,499
United Kingdom	1	evolut.	6,380	0,645	0,438	0,800

Source: author's investigation

The calculations were made using the DEAP 2.1 program developed by Coelli, T.J. (1996) from the University of Brisbane, Australia.

Table 3.2. Rating of countries in terms of the relative efficiency of the state regulation of the social sector in the national economy

Countries	Group of countries	Type of institutions formation	Relative efficiency	Rating of countries
Italy	1	Evolut.	1.000	1
Turkey	2	Evolut.	1.000	2
Georgia	4	Revolut.	0.936	3
Lithuania	3	Revolut.	0.868	4
Latvia	3	Revolut.	0.853	5
Portugal	2	Evolut.	0.823	6
Denmark	2	Evolut.	0.820	7
Estonia	3	Revolut.	0.769	8
Finland	2	Evolut.	0.750	9
Sweden	2	Evolut.	0.721	10
Romania	3	Revolut.	0.704	11
Germany	1	Evolut.	0.686	12
Netherlands	2	Evolut.	0.674	13
France	1	Evolut.	0.664	14
Austria	2	Evolut.	0.662	15
Belgium	2	Evolut.	0.654	16
Russian Federation	4	Revolut.	0.642	17
United Kingdom	1	Evolut.	0.625	18
Armenia	4	Revolut.	0.616	19
Ukraine	***4***	***Revolut.***	***0.571***	***20***

Source: author's investigation

Analyzing the results, we can see that state regulation of the social sector in Italy and Turkey is characterized by the highest values of relative efficiency. These countries form the effectiveness boundary against which measures of improvement will be proposed for lower-ranking countries. Italy and Turkey will serve as benchmarks.

Unfortunately, the calculations showed that Ukraine uses the potential of the institutional quality of the social sector 42.9%

(1- 0,571) lower and has the worst relative efficiency index, taking the last place in the ranking.

As noted above, the DEA analysis lets us obtain more detailed information and guidance on how to improve the effectiveness of government regulation. We will illustrate the use of DEA analysis through the data for Ukraine outlined in the table.

Table 3.3. Results of DEA – analysis for Ukraine

Relative efficiency 0.571

Variable	Symbol	Calculated value	radial movement	Slack Movement	Targeting value	
Social Capital (SCI)	Result 1	0.571	0.430	0.000	1.001	
Social Infrastructure (SII)	Result 2	0.210	0.158	0.228	0.596	
Social Security (SSI)	Result 3	0.499	0.376	0.067	0.942	
Institutional Quality of the Social Sector of National Economy	Resource 1	4.696	0.000	0.000	4.696	
Country-benchmark	Turkey					
Lambda weight	1.891					

Thus, the relative importance of the economic efficiency in state regulation of the social sector of the national economy is 0.571, which is 42.9% lower than in Italy and Turkey, the latter is the country with which we compare. That is why it is necessary to direct the impact of state regulation of the social sector at improving all three dimensions of the social sector.

The most problematic component is social infrastructure. An increase in the quality of infrastructure for social development should ensure a 183% of social infrastructure index growth. The social protection is in the second place, the development of which should be identified by the growth of the corresponding index of 88.9%. Thirdly, the promotion of social capital is also

a significant factor. State regulation of the social sector will be considered effective, including with the increase of the social capital index by 75.3 per cent.

3.3. Foreign experience of state support of social enterprises

The scientific and practical interest in social enterprises is explained, above all, by their importance in solving social problems and challenges that are particularly relevant to transitional and developing economies.

At the initial stage of their activity their work was considered in a limited list of spheres and areas (labour integration - training and employment of persons with disabilities and social groups who are in difficult life circumstances; provision of individual social services in education, health care, social protection, child care services, etc; development of depressive territories). Today, almost all sectors of the economy in many countries have examples of successful functioning of social enterprises (financial sector - social finance, micro-credits, labour integration of socially disadvantaged groups).

The OECD determined (2013) that it is difficult to define the social enterprise and it depends on the country. Noya and Clarence (2007: 248) identify the social enterprise as any private activity undertaken in the public interest organized by an entrepreneur whose strategy and main purpose is not to maximize profits but to achieve certain economic and social goals, which bring innovative solutions to such problems as social exclusion and unemployment through the production of goods and services.

Mendell and Nogales (2009: 93) describe social enterprises as "a new innovative business model that meets both social and economic goals that foster employee integration into the labour market, social inclusion and economic development (They

propose the following definition of social entrepreneurship: a social enterprise is a private autonomous organization that provides goods or services for the benefit of a community, owned and operated by a group of citizens with limited material interest of investors.

The social entrepreneurship concept has become more widely understood by participants, and now includes co-operatives, non-profit, and community businesses (Mendell and Nogales (2009). The OECD (2013) views social enterprises as part of a social economy that covers a wide range of other organizational forms. The authors note the growth of the entities organization forms operating in the social sector, some types of which are social enterprises. The traditional economic theory focuses on maximizing profits. Hungarian (non-profit) organizations, social economy entities and social enterprises today create a powerful resource in each country's economy, and they play an important role in providing many goods and services, maintaining effective employment, and reducing poverty.

Development of forms and methods regarding the relationship between different subjects in the process of meeting public needs has caused the development of unconventional entrepreneurship form from the standpoint of classical economic theory - social enterprises. These new organizational forms are seen as a new form of business activity that combines social purpose with business European Commission (2015).

As Borzaga, C. Depedri, S and E. Tortia (2010) point out, social enterprises are created as a response of civil society to the new social needs of citizens, forming new organizations that better adapt to market mechanisms to solve these problems, while filling market failures, which should be eliminated by the state. Thus, it can be stated that the institutional changes of the social sector, which are peculiar for the economies of most countries in the world, have intensified the processes of social

enterprises development. The latter reflect changes that affect both property relationships and income sharing and management principles.

The recognition of the social enterprise's importance for the development of the European Union economy is confirmed by the decision of the European Commission, (2015).

However, in order to understand the current trends in this area, as well as to form recommendations for Ukraine to promote the development of social entrepreneurship, we have summarized the experience and highlighted the best practices for implementing the policy of regulating the development of social enterprises in some countries in Europe. The basic complexity of social enterprise research is a clear definition. It is the starting point in measuring the volume of activity, comparing by type, industry, country, as well as the formation of appropriate regulatory procedures. It should be noted that at present the definition of a social enterprise has not been agreed yet, and its basic feature is clearly distinguished by solving an urgent social problem. Profit is actually a secondary goal of the business.

We believe that according to the European Commission, social enterprise is the most accurate understood from the standpoint of taking into account the peculiarities of its activity and its status (legal and social). As noted by the European Commission (2015), no new definition of social enterprise is actually proposed, but a generalized vision based on existing, widely used concepts of social enterprise, such as (European Commission) has been formed.

According to the European Commission (2015), social entrepreneurship integrates three key aspects related to its functioning, which have been developed and improved over the last decade by the European scientific community and practice:

- the entrepreneurial dimension, i.e. the description of the commercial aspect of social enterprise activity, that is the

subject of economic activity, which observes social enterprises as a separate entity, different from the traditional non-profit

- the social dimension, i.e. the primary purpose of creating and operating a social enterprise is a social purpose that distinguishes social enterprises from other business enterprises;
- the managerial dimension dictated by the purpose of its activities. Other approaches to the distribution of profits and assets, the management structure, are implied.

The advantages of the proposed definition mean that it lets clearly distinguish social enterprises from other traditional types of enterprises and traditional subjects of the social economy as well as form an understanding of the social enterprises' prevalence and activity regardless of the socio-economic environment in which it operates.

For each of the three dimensions, basic criteria are developed that can be used to describe a particular economic entity as a social enterprise, including:

1. The organization must be engaged in economic activity, i.e. it must carry out the continuous activity in the production (exchange) of goods, works, services;
2. It must have a clearly identified and publicized social purpose, i.e. this organization must operate in order to meet the public need (needs), solving current social problems of the community as a whole or of individual social groups;
3. The social purpose has priority over the commercial one, and therefore determines the principles and procedures for the distribution of profits (assets);
4. The organizational structure should be designed in such a way as to ensure independence in decision-making from other stakeholders, precisely from the point of view of the social goal priority.

5. Transparency and inclusiveness of management procedures.

However, solving the issue regarding a coherent and complete definition of a social enterprise does not settle the complex problems related to its functioning. The analysis identifies such legal, institutional and economic difficulties that are present in most countries, given the specific nature of each country in the particular aspect of the social enterprises' functioning to determine their functional role.

It is difficult to specify such a role for social enterprises agreed in most countries since their legal form, size, purpose and financial turnover differ not only in the countries but also in the industries in which they operate. There is also no consensus on their importance for the development of individual communities or society as a whole.

Obviously, this situation complicates the development of a single framework for regulation. The types and approaches for this area vary greatly.

One can distinguish 2 types of social enterprises' activity regulation:

- integration into the general economic policy of regulation (regulation of the social (non-profit) sector, entrepreneurship, employment, social policy on inclusivity of certain socially least protected categories), i.e. absence of a coherent separate regulatory policy;
- distinguishing into the separate direction of economic policy.

The first approach, which on the one hand simplifies and on the other hand, complicates the regulatory process, is now more widespread. However, more in-depth analysis lacks data to draw conclusions about the effectiveness of different approaches, and even more so to generalize for cross-national use. It requires an in-depth comparative assessment based on the extension of the information base.

According to a report from the European Commission (2015), the analysis shows that only seven (Bulgaria, the United Kingdom, Italy, Luxembourg, Slovenia, France, Sweden) among 29 European countries have formed and implemented a separate policy that encourages and supports the development of social enterprise. Seven countries are in the process of developing a specific policy framework for social entrepreneurship (Ireland, Latvia, Lithuania, Malta, Poland, Romania, Croatia). There are also some countries which do not prioritize their own economic policies for the implementation of a separate policy to support the development of social enterprises (Germany, the Netherlands and Finland).

Given the high level of national governments autonomy, the principles, approaches and tools for supporting social enterprises in different countries differ significantly. Summarizing the experience of those countries that have already taken significant steps towards supporting the development of social enterprises, we can distinguish the following achievements, which can be taken into account when developing appropriate policies in Ukraine:

- institutionalization of social enterprise through the creation of appropriate legal form and / or consolidation of legal status;
- introduction of fiscal instruments to stimulate and invest in social enterprises (support for social impact investments);
- development of infrastructure aimed at supporting the sustainability of this type of business (advisory and training support aimed at clarifying the features of social enterprise activity as a separate type of entities in the national economy;
- measures aimed at facilitating access to markets, in particular, public sector markets (by creating demand for social enterprise services, improving tender procedures to take social enterprises' priorities into account);

- measures to support access to finance through the creation of innovative financial instruments and the development of social investment markets;
- introduction of procedures for collecting information on the activities of social enterprises, in particular, standardized reporting systems and measuring social impact.

The legal status of social enterprises is also a major problem today in most countries. And in this matter, there are two general approaches to consolidating the legal status of social enterprises, their advantages and disadvantages.

Sixteen European countries have some form of legislation that recognizes and regulates the activities of social enterprises. There are two broad approaches to the legal regulation of the social enterprises' activities: creating a legal form on the basis of current legislation (adaptation of the cooperative legal form (Greece, Italy, Poland, France)), or the recognition of a social cooperative (cooperative with social goals - Spain, Portugal, Hungary, Croatia , The Czech Republic) and the introduction of a new legal form into national law (the UK has introduced a legal form for social enterprises - Community Interest Company).

Some countries (Belgium, Denmark, Italy, and others) have introduced such legal statuses that make it possible to apply to different legal forms of enterprises and different types of organizations, provided that they meet the statutory criteria. For some countries, the legislative proposals envisage the creation of a separate status for social enterprises, including Latvia, Luxembourg, Malta and Poland.

Legal status can be obtained if all existing legal conditions are fulfilled by an enterprise created in a certain legal form. In Belgium, for example, the status of a Social Assistance Society has been introduced, which can be acquired by a legal entity (cooperative form, joint-stock company), provided that such enterprises do not have the enrichment of its members.

In Italy, the legal status of a social enterprise can be obtained by all organizations - cooperatives, social cooperatives, joint-stock companies, associations or foundations, even if a number of requirements are fulfilled.

Another example of the social enterprise creation is the experience of a non-profit organizations transformation that enables to carry out economic activity, although the latter was not foreseen during their creation.

A key requirement is a restriction on the distribution of profits and assets – investors who invest in such businesses can receive a rate of return of no more than 4%. Besides, when the social enterprise stops its operation, there are restrictions on the distribution of assets - the latter can not be distributed to members (founders), and must be transferred to the public non-profit organization.

When we consider Ukraine, positive developments should also be noted. Thus, by the Law of Ukraine "On Public Associations", a public association with the status of a legal entity has the right to be engaged in entrepreneurial activity directly if it is provided by the statute of this association, or through the creation of legal entities (companies, enterprises), if such activity corresponds the purpose (goals) of the public association. Similarly, under the Law of Ukraine "On Charitable Activities and Charitable Organizations", charitable organizations have the right to perform any activity that contributes to the achievement of their statutory goals, without pursuing the purpose to get profit.

Successful examples on the introduction of new legal forms of social enterprises and their requirements can be given, particularly, in the UK, such companies have:

- to contribute to the achievement of the social goal (meeting the social need);
- the ability to carry out any economic activity freely;

- restrictions on profit sharing and asset utilization;
- to involve a wide range of stakeholders in their activities;
- to report annually on the achieved social results of their activities.

Joint-stock companies have right to share profit. However, there is a restriction in order to set up such an enterprise - it must be created to fulfil the interests of the community, the creation must be justified.

Asset restriction provides a legally mandated stipulation that company assets can only be used for social purposes. It also provides for a limitation on profitability and capital that a company can pay to shareholders is formed in a system of two limitations: the first is a restriction on distributable profit, and the second is a restriction on earnings per share. These are adjustable parameters that can be changed.

The question of determining the specific value is solved depending on the intention of the regulator to stimulate investment - in case of increasing priority for the state of this type of investment, the size of payments may be increased. There are real-world examples of using this rule as a tool that, on the one hand, creates an environment that is conducive to social investment, and on the other, directs companies' efforts to achieve their primary goal.

There are also restrictions on the use of assets of a joint-stock company after liquidation.

As noted above, some countries have adapted a cooperative form to create social cooperatives. The adaptation was to harmonize the legal form of the cooperative with the goals that the cooperative pursues. It means that social cooperatives have been created - a cooperative that must define a specific social purpose (as opposed to the mutual interests of its members). This objective may be related to the labour integration of individuals (those in difficult circumstances, persons with special needs),

and the requirements for the number of persons to be employed by the cooperative. There is also the practice to set up such cooperatives for other purposes than labour integration. In particular, there are two types of social cooperatives in Italy: cooperatives providing social, medical and educational services and cooperatives that may deal with any other type of economic activity but promote the integration of certain social groups in the labour force.

There are also examples of restrictions that affect not only social but also economic goals, i.e. the purpose of creation must be related to the production or sale of products that offer social benefits. Broad involvement provides the integration of service users, employees and volunteers into one.

We consider the experience of Greece to be interesting for Ukraine, where legal recognition of traditional social enterprises by introducing three different types of social, classified according to their purpose is offered:

1. Social cooperatives aimed at social and economic inclusion of persons belonging to vulnerable groups, mainly through employment.

2. Social cooperatives aiming at the production and supply of goods or services in the social services field (social assistance in the field of health), specific social groups of the population (seniors, children, people with disabilities, etc.).

3. Collective and industrial social cooperatives aiming at the production and supply of goods and the provision of services to meet the needs of communities (traditionally the spheres of culture, environmental protection, education, distribution of goods in a particular locality, etc.).

Social cooperatives in the Czech Republic can set a broad range of social goals, including sustainable development and environmental protection, according to the legal field, but with

a compulsory priority for the needs of a particular local community, meet local needs and use local resources.

All the above types can be implemented in Ukraine since each region needs to develop such social services. Moreover, this differentiation of types will allow a differentiated approach to the use of regulatory instruments, depending on the priority of a social goal. It is important, in addition to expanding the field of activity, that would really help to stimulate the development of this segment in the domestic economy to establish a flexible system of restrictions since only in this case we can expect to meet social goals and meet social needs.

The experience of those countries that allowed foreign capital to invest in such enterprises is important for Ukraine. Given the scarcity of internal investment resources, two goals would be achieved: to improve social outcomes and create additional economic effects in the form of employment growth and, consequently, local budget revenues, which under the decentralization conditions will become an additional resource to develop local communities. Although the rate of return for our environment may be revised, the application of a 3-4% rate of return on dividends in the context of high systemic risk does not cause proper interest.

Examples of integrated systems for regulating the activity of social enterprises that can be used in the process of forming an appropriate regulatory base in Ukraine.

In Belgium, any society or cooperative can acquire social status. The most common legal form is a limited liability company. For joint-stock companies - subscription for external investors, dividends are limited (maximum - about 6 per cent of the amount paid per share); after liquidation - the return of capital to shareholders, the surplus is distributed to a non-profit organization or social enterprise for similar purposes.

Denmark introduces a social enterprise registration system that can provide a basis for identifying a specific subsector. The registration system will allow businesses that meet certain standards in terms of their functioning and transparency, to demonstrate their social features to authorities, business partners and customers through the exclusive right to use the status of "registered social enterprise". In order to be eligible, an enterprise must have a social purpose that is more important to it than the functioning of a business. All businesses that are registered as social are subject to a number of specific requirements for managing them, as well as restrictions on profit sharing. If the company does not comply with the requirements of the law, it can be removed from the register.

In Italy, there are wide legal forms such as associations, foundations, joint-stock companies, cooperatives, etc. A social enterprise combines entrepreneurial activity with social goals and can only operate in certain defined sectors. They include social assistance; health care; education; conservation of the environment; cultural heritage; social tourism. The status of social enterprises can also be obtained by organizations engaged in business activities, in addition to the activities defined above, if it is focused on the integration of persons with disabilities or other socially vulnerable groups.

The activities of a social enterprise are limited to achieving its social goals and cannot distribute profits. Profits should be used either to further the core business of the organization or to increase the capital of the organization. Social enterprises are obliged to consider forms of employees' and other stakeholders' involvement in the management of social enterprise activity, which provides any mechanism: consultations or participation through which employees or other stakeholders influence the decision-making process in the social enterprise.

The development of social enterprises through a form of the joint-stock company in Austria, in particular, has revealed its disadvantages, pointing to the necessity to revise the definition of public goods, because it does not meet modern needs. Activities that are considered socially useful, are quite limited, in particular NGOs should work directly with persons who need care that can actually exclude certain areas of activity. Second, there is a necessity clearly to define the purpose of the public activity and to identify the target group in the statute when the organization is founded. It greatly reduces flexibility and hinders the development of social enterprises, which, together with stringent reporting requirements, creates a significant administrative burden. In addition, the ability to accumulate reserves is limited, which in turn restricts access to finance.

Last but not least fact is that capital requirements are seen as a barrier for social enterprises (but it is not the case for private limited companies). The above disadvantages concerning Austria are also peculiar to Germany.

Integration enterprises as a form of social enterprise are interesting in terms of employment regulation and labour market development. Some European countries are developing this type of social enterprise (Bulgaria, Spain, Poland, Romania, Slovenia).

The term "integration enterprise" means that an enterprise of any legal form is considered an integration if it meets the criteria defined by law. For example, in Poland, the law on promoting employment and labour market institutes established three main types of entities to support permanent employment for certain persons: a social integration club offering civic education development programs; a social integration center offering civic education support programs; pre-employment training, a social cooperative entitled to receive state funding from a special labour fund.

In Bulgaria, cooperatives of people with disabilities are formed, which have restrictions on the proportion of people with permanent disability - at least 20% of all staff of a specialized social enterprise for the blind must be blind, etc.

Social enterprises financing: experience and practice

The income sources composition of social enterprises and subjects of the social sector of the national economy varies considerably, both between countries and within them. International research identifies three major sources of income: revenue generation activities (including fees for services, sales, membership fees, rents, investments, business ventures, etc.); public financing; and charitable contributions and donations (including financial donations and in-kind support (Nicholls, J., 2007).

In a study regarding the features of social enterprises in Central and Eastern Europe, Hadzi-Miceva, K. and N. Bullain (2007) note that in some countries individual sources are more prioritized, but suggest that it may be advantageous for countries to develop a legal environment , which enables social enterprises, market participants to access the full range of sources of income, which in turn will allow them to develop more resilient resource bases, while generating a synergistic effect from the combination of different sources of income, including higher income from activity enhances the use of public funding by Hadzi-Miceva, K. and N. Bullain (2007).

The social enterprises functioning under conditions of broad funding opportunities make it possible to provide services that cannot be funded through government programs or other funding streams. However, it is important to understand that development and financing strategies should take into account the development stage of the sector (sub-sector) in which the enterprise operates, the conditions of a particular country, region, etc.

Social enterprises, despite their importance for the development of specific areas that are generally depressed, often have greater difficulties in accessing financial resources than commercial enterprises, that is generally objective in a market environment. In this context, government regulation should focus on creating appropriate support conditions.

For Ukraine, the problem is complicated by the underdeveloped financial market and the country's high level of risk.

However, it is important to understand the possible directions for the development of financial mechanisms, because in the current environment there is a demand from investors for this type of investment, which, firstly, is long-term oriented, and secondly, allows to combine financial returns with social impact. Some intermediaries are formed to help connect investors with social enterprises, at the request of the market. According to the researchers, this market is unstructured.

Researchers in the UK market say that the current market for social investment is very decentralized and is under conditions of its initial development. There are thousands of organizations in the UK offering grants, loans and investments in social enterprise stocks. However, such differentiation is conditioned by the fact that social enterprises often resort to a combination of different funding mechanisms, each with its own accountability, which complicates administration since more attention is paid to management in this aspect rather than the social aspect of the activity.

Proper guidance regarding the size and type of investment will help social enterprises to manage financially (to balance the cost of financing and risk), to formulate a strategy for the development of funding sources from grant to own financing. For standard business models, choosing the type of financing is not a difficult task, but social enterprises have other priorities,

so traditional approaches to capital management are unacceptable to them.

Thus, summarizing the analysis, we can conclude that the legal recognition of social enterprises is an important prerequisite for their development since the appropriate legal status recognizes the specifics of social entrepreneurship and helps to give them a clear and legally secured separation from the totality of entities.

The clear identification of social enterprises lets regulators form and implement specific public policy measures to support social enterprises, social investors, and enables to regulate and reduce abuses of social enterprise status in the legal plane.

In addition, legal recognition is the first step to creating an environment of connecting potential investors and social enterprises, which will activate market mechanisms for their interaction and will contribute to solving not only social problems but also economic problems of growth and development.

Such legal and institutional steps let clearly differentiate social enterprises and other commercial entities and companies. However, it is important to create an adequate institutional environment that would, on the one hand, promote the development of this segment of the national economy and, on the other, not provoke abuses at the expense of tax breaks and do not discredit social entrepreneurship as a significant driver of sustainable and inclusive economic growth.

It is important to keep in mind that, although specific legal forms have been successful in several countries (Italy and the United Kingdom), they are not particularly popular in other countries. With regard to comparing the advantages and disadvantages of the specific legal status of social entrepreneurship, there is currently insufficient evidence to assess factors that clearly identify the priority of one form over

another, mainly because these legal statuses have only recently been introduced in many countries.

Based on the available evidence, it is impossible to conclude which of the two specific approaches to determining the legal status of a social enterprise is preferable since each has its advantages and disadvantages. Finally, the legal vision of social enterprises must be based on national considerations, the economic environment, the verification of social performance and accountability, compliance monitoring, etc.

Social enterprise incentive tools

The issue of incentives is generally considered in the context of the tax incentive provision for social enterprises, which is now even less developed than their legal status. Common approaches to the taxation of social enterprises in European countries have the following common features:

- tax benefits prevail for certain forms of nonprofit organizations;
- they may be offered for integration enterprises if the concept of their development provides it;
- tax breaks can be introduced for certain forms of activity carried out by these enterprises;
- there are regional and local differences in the taxation of social enterprises.

Non-profit organizations are generally entitled to the following benefits:

- tax benefits and capital tax incentives;
- tax exemption from certain forms of spending;
- tax deductions for donations to donors;
- exemption from inheritance tax for donors;
- exemption from property transactions;
- exemption from local or municipal taxes, etc.

In order to be eligible for a tax benefit, a nonprofit organization often needs to prove that it exists for the public

benefit, has a social purpose, and limits on profit sharing, does not work for the benefit of its members or leaders, is accessible to low-income individuals, and meets with other qualifying conditions (minimum term since creation, minimum level of financial resources).

In the vast majority of Member States, there are favourable tax regimes for such public-benefit organizations and social enterprises, with only a few exceptions, including in Denmark and Romania, the tax exemptions do not apply to non-profit organizations engaged in trade activities, because trading activity necessarily requires the creation of a separate trading subsidiary. In most Member States, non-profit organizations are only allowed to carry on trading activities in order to achieve it.

In some cases, such as Portugal and Romania, certain tax exemptions are a gift for local or regional self-government, which has the right to grant, for example, exemption from the property.

However, not all nonprofit organizations are considered to exist for public benefit. Some exist for the benefit of their members or for other private purposes. It means that a social enterprise created as a non-governmental (non-profit) organization (association, fund, institute, non-profit companies, etc.) may not receive tax exemptions applicable to public organizations.

Particular attention should be paid to tax incentives for so-called integration enterprises, as they solve the overriding task for each economy - increase productive employment. Therefore, the following benefits are traditionally used for them:

- partial reimbursement of employees' wages;
- reduction or exemption from social security contributions;
- partial or complete exemption from corporate income tax.

In addition, these enterprises often receive other forms of subsidies, such as job adaptation grants and subsidies for other

relevant costs, such as the cost of specialized training, transportation costs or the cost of specialized or adapted equipment. Tax benefits are usually calculated if they comply with the basic requirements for the legal status of the enterprise, which relate to such factors as the status and the number of persons employed in the integration enterprise, etc.

In addition, many European countries have a number of tax breaks for certain types of activities that non-profit organizations or social enterprises deal with: educational activities; development and implementation of innovations; charitable activity; purchase of certain forms of assets; job creation in certain high unemployment areas; investments in small and medium-sized companies; etc. It serves as an additional impetus to the development of the social services market in these areas.

Other legal statuses related to social enterprises include public benefit organizations, which generally have tax benefits if they fulfil public goals; programs related to employment through company-specific tools of motivation to encourage the employment of people in difficult circumstances.

Many European countries legally recognize non-governmental organizations, which can be obtained according to certain criteria, that entitles them to tax benefits and other benefits depending on the country. For example, Polish non-governmental organizations may apply for the status of NGOs if they have experience of public interest for at least two years and meet other criteria, such as the publication of information on activities. In Ireland, joint-stock companies and non-profit companies. They have a social (charitable) purpose that does not distribute profits as ordinary companies can apply to the tax authority for tax benefits, a similar preferential status procedure is granted to non-profit companies in the United Kingdom and associations in Switzerland, pursuing social goals without profit sharing.

In Austria and Germany, joint-stock companies can pretend to tax benefits if they pursue a social purpose (such as education, health, science, culture) and do not share profits. In these countries, private limited liability companies and associations may also be granted preferential tax treatment if they are recognized by public organizations. In order to get a status, an organization must be engaged in public activities, meet public needs, and use assets only for such purposes.

Community goals are seen as broad-based and implemented in the areas of social services, services for the elderly and disabled, promotion of the arts and sciences, health care, social housing projects, education, environmental protection, disaster relief, development assistance, consumer protection, sports.

Therefore, the main conclusion that can be drawn from the analysis is that social enterprise is a special type in the modern economy, which provides goods and services in the market according to the entrepreneurial model, and uses profits primarily to achieve social goals.

Normalization of legal status lets social enterprises form more stable bases of resources. Moreover, in the financing process, social enterprises also receive additional support in the form of investors' experience and professional support in the relevant field. For investors who are serial players in the market, it is able to support innovation and help build a social enterprise. However, most investors traditionally prefer a more pragmatic approach when choosing an investment object.

At present, the development of social enterprises and the social economy has generally led to the development of financial cooperations with investors, including the possible involvement of investors directly to participate in the achievement of the social purpose of the company. Some may provide technical support along with loans and grants. Participation in the equity of social enterprises remains the most important since it provides

the greatest opportunities for the long-term financial sustainability of social enterprises. The organizational mission of social enterprises explains why they limit their profitability and reduce private allocations by accumulating fixed assets to develop productive activities.

The increasing importance of social enterprises is stimulating the emergence of new regulatory approaches aimed at recognizing and supporting these enterprises. Traditionally, the variety of legal forms concerned the development of different cooperatives types, but after the financial crisis, the other forms and types of organizations began actively to develop.

It is important to understand that the main institutional constraint on social enterprise activity is the social purpose of creation and operation. This restriction lets direct resources to a clearly defined purpose, therefore, other stakeholders' interests are rather top-priority than owners' interests. In addition, the service quality is thus given greater attention. The general advantage of such a rule is that it helps to increase trust and reduce transaction costs.

In Ukraine, many projects for the development of social entrepreneurship have been recently implemented with the support of international donors, and there are online platforms to support such initiatives, but it is important to form a state regulatory policy that will determine the legal and institutional field of their functioning.

The absence of a sound theoretical base for social enterprise research requires that it will be possible to formulate recommendations on management approaches and organizational structure, starting with an in-depth analysis of the institutional framework. On this basis, it is possible to determine an appropriate stimulation structure that provides not only monetary forms of stimulation but also relevant social, image elements.

3.4. Prioritization of the directions in the state regulation of the national economy of Ukraine taking into account socio-economic and political interrelations

Having identified the individual influence of public administration features on the parameters of economic, social and political development of Ukraine in the previous stages of the research, it is advisable to study the priority of the state regulation instruments application in the process of the complex interaction of socio-economic and political components. This study is relevant given the fact that Ukraine's social, economic and political interconnections are indispensable, as well as its limited financial resources. It means that the existing system of public administration in Ukraine requires the determination of the priority of steps in a particular activity sphere since both the institutional and financial components of state regulation do not allow simultaneous effective measures in all spheres of society.

Thus, it is proposed to develop a scientific and methodological approach to assessing the impact made by the components of the integral indicator of the socio-economic-political condition based on the structural modelling and factor analysis. The results obtained in the process of implementing the proposed scientific and methodological approach will let select the most effective instruments of state regulation, taking into account socio-economic-political-interconnections, based on the establishment of the development direction priority in Ukraine in the short and long term.

Turning to the analysis of mathematical tools to implement the proposed scientific and methodological foundations, we note that structural modelling will be carried out by constructing a system of simultaneous linear pair and multiple regression equations. It will allow us to determine the parameters of each component evaluation: social, economic and political, using a two-step least squares method. These parameters will make it

possible to state the nature and direction of the interdependence of the socio-economic and political status components in the short and long term.

Factor analysis, in turn, is based on a combination of the principal component method and the scree method and identifies the priority and percentage of the impact of the economic, political and social components. This step will form an information base to make effective management decisions in the state regulation sphere and further use of relevant instruments of influence.

Let us turn to the practical features of the stages to implement the scientific and methodological approach to assessing the impact of the components of the integral index of the socio-economic and political status features based on structural modelling and factor analysis.

In the first stage, we will carry out structural modelling of the socio-economic and political situation in the short term. In order to implement this phase, Statistica software package is used, namely analysis tools, advanced methods, structural equation modelling.

The normalized values of the social status index, the political component evaluation index, the economic component evaluation index, and the integral index - the artificially formed radius of a circle described around a triangle (the sides of which are normalized values (tables 3.4) are chosen as informational support to implement the scientific and methodological approach.. In the input file the following values are taken: 1) explicit variables: social - normalized values of the index of, exogenous variable; economic - normalized values of the index of economic component assessment, endogenous variable; political - normalized values of the index of political component assessment, endogenous variable; 2) latent implicit variables: SOC - level of social component development, ECON - level of

economic component development, POLIT - level of political component development.

Table 3.4. Information support for structural modelling of socio-economic and political status in the short term

Year	Indices			
	Political	Economic	Social	The radius of the circle
2012	0,3465	0,1456	0,2829	0,1780
2013	0,3300	0,1628	0,2984	0,1654
2014	0,2917	0,1968	0,3294	0,1662
2015	0,2957	0,1662	0,2829	0,1514
2016	0,3143	0,1301	0,4070	0,2569
2017	0,2882	0,2223	0,4046	0,2086
2018	0,2799	0,2364	0,4046	0,2075
2019	0,2668	0,2579	0,4377	0,2379
2020	0,2496	0,2449	0,3969	0,2072

In order to construct a mathematical model of socio-economic and political state (estimation of unknown parameters of the model (3.4)) using a system of simultaneous interdependent structural equations, as well as to identify the mutual influence of these factors, a two-step least squares method is chosen. The expediency of using this method is due to the fact that the equations system (3.4) is over-identified. This is due to the fact that the number of given coefficients is less than the number of structural coefficients. It enables to estimate the structural coefficients of the equation using the parameters of the reduced form of the model.

Thus, it is necessary to apply the two-step method of least squares, the essence of which is:

1) to bring the form of the model to an end when the endogenous variables of the right-hand side of the equation will have theoretical values;

2) to apply the least-squares method to an equation in which theoretical values are substituted instead of the actual values.

Thus, in order to understand the peculiarities of modelling the interconnection of the integral index components in the socio-economic and political state, with the help of structural equations, we present the general view of the system of simultaneous linear pair and multiple regression equations as follows:

$$\begin{cases} \widetilde{IE}_i = s_1 \cdot SOC_i \\ R_i = RL_i + r_o \\ RL_i = r_1 \cdot SOC_i + r_2 \cdot ECON_i + r_3 \cdot POLIT_i \\ ECON_i = e_1 \cdot SOC_i + e_0 \\ POLIT_i = p_1 \cdot SOC_i + p_2 \cdot ECON_i \end{cases} \quad (3.4)$$

where $\widetilde{IE}_i$– the normalized value of the index to assess the economic component per i-year;

SOC_i – the latent variable of the social state level;

R_i – the radius of the circle around the triangle, the sides of which are normalized values of the index to assess the social state, index of the political component assessment, index of the economic component assessment per i-year;

RL_i – the latent variable for assessment of the integral index of the socio-economic and political state;

$ECON_i$ – the latent variable of the economic component level;

$s_1, r_o, r_1, r_2, r_3, e_1, e_0, p_1, p_2$ - constants.

Based on the data from Figure 3.4, we will formalize the system of structural equations (3.4), taking into account the numerical values of the calculated parameters in the following form:

$$\begin{cases} \widetilde{IE}_i = 0.195 \cdot SOC_i \\ R_i = RL_i + 0.500 \\ RL_i = -0.268 \cdot SOC_i + 0.965 \cdot ECON_i + 0.500 \cdot POLIT_i \\ ECON_i = 0.307 \cdot SOC_i + 0.115 \\ POLIT_i = 0.363 \cdot SOC_i + 0.500 \cdot ECON_i \end{cases} \quad (3.5)$$

Analysis of the equations system (3.5) makes the following conclusions:

- the link between the social component and the integral index of socio-economic and political status in the short term is reversed (as evidenced by the minus sign before the -0.268 parameter), i.e the improvement of the social component by 1 unit will be followed by the deterioration of the socio-economic and political state 0.268 units and vice versa. This relationship is quite natural in the short term since all social programs and reforms have a negative impact on the economic situation in the country, as they require significant expenditures of the state budget, and cause resonance among politicians, because the latter, as a rule, initiate various social transformations and lobby for their own reform programs.

- the economic and political components have a positive impact on the socio-economic and political state since the corresponding parameters of equation (3.5) are 0.965 and 0.500 respectively, which indicates an increase in the integral result factor with increasing of these factors. Thus, it is fair to point out that the economic and political components have a much faster impact on the synergistic effect and, consequently, almost immediately cause improvement of the national economy.

Checking the results for adequacy, we note that:

– the current values of the disagreement function are kept to a minimum, which confirms the adequacy;
– current values of the maximum cosines criterion are near to 1, that indicates the adequacy of the obtained results;

- the ICS Criterion value is near to zero. It indicates that the structural model is resistant to scale changes;
- RMS Stand. Residual (Root Mean Square Standardized Residual) is less than 0.05, which indicates a very good fit of the model (a value of this index of more than 0.1 indicates that the model does not adequately describe the data;
- the points of the graph of normalized residuals of the socio-economic-political status model in the short term are located close to the line, i.e. the selected data correspond to the normal law of distribution.

In the second stage of the scientific and methodological approach to identify the priorities of the state regulation directions in the national economy of Ukraine, taking into account socio-economic-political relations, a factor analysis of the influence made by the integral index components of the socio-economic-political status estimation is made on the basis of the principal components method. Statistica software package, namely Analysis, Multivariate, and Principal Components and Classification tools, was used to implement this phase. So, first, there is a need to plot scree to identify the proportion of variance of the integral index of socio-economic and political status under the selected factors influence (figure 3.2).

The analysis of figure 3.2 lets us conclude that it is reasonable to consider only the first factor to determine the impact made by the components of the integrated index of socio-economic and political status since 81.85% of the dispersion of the effective index is caused by the variation of only the first factor.

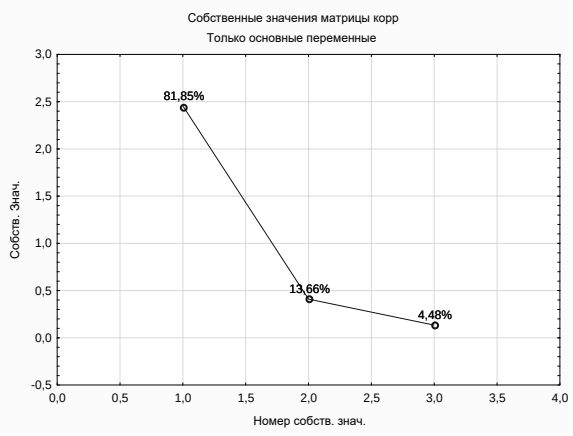


Figure 3.2. The scree plot of the integral index dispersion estimation of socio-economic and political status from constituents

When interpreting these results, we can note that the variation of the first factor means a full vector of parameters characterizing separately the economic, social and political component. Then, having determined the reasonability to consider only the first vector of values on the basis of the scree method, it becomes necessary to estimate the contribution of variables (economic, social and political components) on the basis of the correlation calculation. Thus, economic and political components have the greatest influence since they account for 35.14% and 35.97%. The smallest share of the possible 100% is occupied by the social component at 28.89%. However, it is fair to say that in the short term the impact of the studied components does not differ dramatically, which indicates the importance to use complex instruments of state influence. However, the social component in Ukraine does not yet have such a decisive influence on the country's development as in other developed countries. It is caused by the considerable economic and political instability in Ukraine, which is unconditional. It is the basis of

all successful transformations in the country, including social ones.

A further step (third) of the proposed scientific and methodological approach is to carry out structural modelling of the socio-economic and political situation in the long run. The methodology of realization, mathematical (system of equations (3.5)) and information support of this stage is formed by the analogy of the first stage, taking into account the predicted period up to 2022 (table 3.5).

Table 3.5. Information support for structural modelling of socio-economic and political status in the long run

Year	Indices			
	Political	Economic	Social	Radius the circle
2012	0,3465	0,1456	0,2829	0,1780
2013	0,3300	0,1628	0,2984	0,1654
2014	0,2917	0,1968	0,3294	0,1662
2015	0,2957	0,1662	0,2829	0,1514
2016	0,3143	0,1301	0,4070	0,2569
2017	0,2882	0,2223	0,4046	0,2086
2018	0,2799	0,2364	0,4046	0,2075
2019	0,2668	0,2579	0,4377	0,2379
2020	0,2496	0,2449	0,3969	0,2072
2021	0,2326	0,1827	0,3533	0,1967
2022	0,2194	0,2006	0,3779	0,2406

The general system of simultaneous linear pair and multiple regression equations will be presented as follows:

$$\begin{cases} \widetilde{IP}_i = p_1 \cdot POLIT_i \\ R_i = RL_i + r_0 \\ RL_i = r_1 \cdot POLIT_i + r_2 \cdot ECON_i + r_3 \cdot SOC_i \\ ECON_i = e_1 \cdot POLIT_i + e_0 \\ SOC_i = s_1 \cdot POLIT_i + s_2 \cdot ECON_i \end{cases} \quad (3.6)$$

where $\widetilde{IP}_i$ – normalized values of the political component assessment index.

Practical implementation of the third stage of the proposed method is also possible via the Statistica software package. It will identify the parameters of the pairwise and multiple linear regression equations given in Equation 3.6.

Therefore, using the two-step least squares method to determine the parameters of a structural simultaneous linear regression equations system (3.6) lets us transform it to the following form:

$$\begin{cases} \widetilde{IP}_i = 0.345 \cdot POLIT_i \\ R_i = RL_i + 0.500 \\ RL_i = 0.224 \cdot POLIT_i + 0.112 \cdot ECON_i + 0.492 \cdot SOC_i \\ ECON_i = 0.391 \cdot POLIT_i + 0.191 \\ SOC_i = 0.904 \cdot POLIT_i - 0.692 \cdot ECON_i \end{cases} \quad (3.7)$$

Thus, in the long run, unlike the short term, the social component has a positive impact on the socio-economic and political condition, caused by the increase of the integral index by 0.492 units while increasing the latent variable characteristic of the social component development level by 1 unit.

The economic and political components have kept the trend with the short term period and continue positively to influence the socio-economic and political situation in the long term. Thus, the parameters of 0.224 (the parameter for the political component) and 0.122 (the parameter for the economic component) correspond to these components. The obtained laws are quite logical for the long-term period of national economic development.

Thus, in the course of time, the degree of economic component influence on the integral index decreases, and the social component dramatically changes the direction of

influence from -0,268 units - in the short term to 0.492 units in the long term. It indicates that in the long run, the overall state development will depend on the social well-being of the population to a greater extent.

That is, the driver of state development includes social transformations after it has achieved certain economic growth and political stability. Only a state where the population is physically protected, has high living standards, can provide high-quality health care and retirement benefits that can count on sustainable development, as well as creating all conditions for the transition to the next economic recovery.

The adequacy of the constructed model (3.7) is proved on the basis of the different criterions. Namely, the value of the disagreement function is 0, which satisfies the conditions of adequacy in the form of the direction of the value to 0; the maximum of residuals cosines is 0, which does not meet the adequacy conditions, which are to approximate the value to 1; the ICS criterion far outweighs the zero value, indicating an unstable model structure when zooming; RMS Stand value of 263,234 units indicates an inadequate description of the model by the selected data. In turn, the points on the graph of the normalized residuals of the socio-economic and political status model, in the long run, are close to the line, i.e. it can be argued that the data are normal distribution law.

Thus, the established information base regarding the priority of the state regulation instruments application allows the further building of an effective and consistent map of Ukraine's reforms in the short and long term. It means that analytical calculations let us find out how the three components of Ukraine's development interact.

For state regulators, it will enable to choose the most effective instruments of influence either on the economy, on the social sphere or on the political component in order to obtain the most

positive synergistic effect of Ukraine's transformation in the conditions of limited financial resources. Therefore, for Ukraine, the priority sphere of state regulation should be the economic sphere in the short term, and the social sphere in the long term.

4. THE MECHANISM OF INVESTMENT- AND INNOVATION-DRIVEN INCLUSIVE GROWTH

4.1 Theoretical bases of priority and perspective innovative development on the inclusiveness principles

Awareness of innovative development as fundamental for the growth of socio-economic indicators of both individual households and the state as a whole has led to a change in the priorities of social development in the world. Governments, consumers, suppliers, and other participants in economic relations are focusing their efforts on intensifying innovation processes and the rapid spread of innovation in various sectors of the economy. Such an understanding is especially important today, given the reorientation of modern economic efforts towards inclusiveness.

The World Economic Forum identifies an index that distinguishes countries based on their combined KPIs (Key Performance Indicators): The Development Inclusion Index (IDI). This new global index has a more complex content of the relative state of economic development compared to the generally accepted ratings based on GDP Per Capita. And in conditions of high global competition, the innovative activity of countries based on inclusiveness is a powerful tool for strengthening market positions (Pimonenko T., et. al., 2018).

Considering what was mentioned above, there is an objective theoretical need for integrated, systematic, and strategic approaches to the consideration of promising areas of innovative development on the principles of inclusiveness, which have to meet the requirements of the global market and provide them with a long-term competitive advantage.

Scientific works lack approaches to determining the essence, formation content, and mechanism of the management forecast

component of the national economy's innovation processes, where the inclusiveness of development is embedded in the system of basic requirements. This indicates the need to deepen and concretize the theoretical foundations, the development of methodological tools to identify areas of innovative economic development, which will positively affect the functioning and stability of national economies, and will increase the efficiency of its innovation. And this also will allow distinguishing priority and perspective from among the set of alternative options of development (Thoni C. et. al, 2012)

Introduction of new methods of forecasting and further planning industrial enterprise activity, realization modern concepts of reorientation production on an innovative way of development and introduction of processes principles of society global informatization, inclusive development, improvement of effective management, and organization methods of activity within one production are impossible without advanced theoretical apparatus of the chosen direction and concretization of the basic concepts that form them.

The innovation process is complex and multifaceted, its complication can occur acutely during periods of transition of socio-economic systems from one qualitative state to another when all social relations are aggravated, which sharply produces uncertainty about the further development of the future. In these conditions, it is necessary to focus as much as possible on the strategic goals and objectives of innovation, as well as to identify priority and promising areas of innovation development.

Today, the issues of inclusiveness of economic development are widely studied in the context of sustainable economic development, where some scholars consider it part of the concept of sustainable development, and other supporters single out in an independent direction (Tsapko-Piddubna O., 2018).

Inclusive growth as an independent concept is centered around the interaction of the above economic categories -

economic growth, poverty, income inequality, and opportunities. This concept is at the heart of other development concepts and has formed the basis for shaping the policy of further development of many countries around the world in recent decades. According to the World Economic Forum, inclusive growth should be seen as a strategy to increase synergies between the growth of the national economy and widespread progress in living standards.

Grouping the issues of innovative development and inclusive, it is necessary to understand the bases of their formation, which in retrospect were formed due to the extensive and intensive ways of development of economic objects.

Table 4.1 shows the main characteristics of these approaches to the development of economic objects, as well as the most acceptable methods for forming and forecasting future directions of development.

Table 4.1. Forecasting in the system of choosing the path of development of an industrial enterprise

Ways of development	Description	Development concept	Approach to management	The methods for predicting directions of development
Extensive	Provides for the expansion of production and sales. Characteristic of an unsaturated market, in the absence of fierce competition, in conditions of the relative stability of the business environment. Associated with rising resource costs.	Increasing production	Adminis-trative	- Intuitive methods. - Methods of analogies (analytical)
Intensive	Provides for the use of advances in science and technology to improve the design and technology of production of traditional (modernized) products in order to reduce the cost of their production, improve quality, and ultimately increase competitiveness.	Reduction of unit costs	Systemic	- Statistical methods. - Methods of analogies (analytical)

Ways of development	Description	Development concept	Approach to management	The methods for predicting directions of development
Innovative	Provides for continuous updating of the range of products and technologies of its production, improvement of the production and sales management system. It is based on continuous search and use of new ways and spheres of realization of the potential of the enterprise in changing conditions of the external environment within the chosen mission and the accepted motivation of activity and which is connected with the modification of existing and formation of new markets.	Increase profits	Situational	- Methods of economic and mathematical modeling. - Advanced methods (analytical)
Inclusive	Development on the principle of equality of economic opportunities. . Provides equality in access to markets and resources and in an impartial and legally regulated business environment. Focus on productive employment. Global cooperation and interaction of all parts of economic entities and public policy.	Harmonization of financial growth and living standards	Processual	- Statistical methods - Methods of analogies

In today's society, to predict future activities, any business entity must be able to correctly determine the strategy that will guarantee victory in the competition. The facts show that almost all market leaders owe their success to compliance with the latest trends and tendencies in their industry. Therefore, utilizing modern methods of forecasting future development scenarios is the key to an effective combination of innovative and inclusive development vectors.

Given the practical aspects, it should be emphasized that the new stage of economic and social development in Ukraine is characterized by a growing trend of attention to innovation by the state. The innovative path on the basis of inclusive

development is advanced and provides a high competitive position of national economic.

Ukraine's integration into the EU opens up both new markets and a new competitive environment for domestic producers. The conformity of the products must be predictable to the needs of the market. Management decisions should be based on approaches to identifying effective trends that will be demanded by the market (Bilan Y., 2019).

Given the need to combine vectors of innovative development and inclusiveness, we have identified the following features of innovative activities of industrial enterprises, which are relevant from the standpoint of formation and future forecasting of development: use of intellectual and technological capabilities of science and technology; high level of realization of technical and economic possibilities of the organization of production and sale; the significant impact of the external environment on the situation of the enterprise; the ability to create and implement innovations at all stages of the production cycle; characterized by some alternatives for the development of sales activities of the enterprise, based on the constant modernization of the world economic system.

In addition to these features, you should pay attention to the need to account for costs in a way that allows you to use prices compatible with the purchasing power of consumers, as well as the ability to promote goods and services in the market in a more efficient way than competitors.

At the same time, the inclusive indicators of the World Economic Forum include indicators of education and knowledge, basic services and infrastructure, corruption and unhealthy competition, financial intermediation in real sector investment, asset creation and entrepreneurship, employment and remuneration for work, the fiscal burden.

These characteristics and features of innovation and inclusive economic growth to form and forecast future directions of

development determine the separation of criteria that must meet the method of forecasting future directions (Table 4.2).

Table 4.2. Characteristic features, features of innovative activity of economic objects from formation and forecasting of future directions of development on the principles of inclusiveness

Characteristic features of innovative activity that are important in forecasting of inclusive areas of development:	Requirements for choosing a method for forecasting promising areas of innovative development	Methods of forming and forecasting promising areas of innovative development should:
• Intellectual and technological possibilities of using the achievements of science and technology. • High level of realization of technical and economic possibilities of the organization of production and sale. • A Significant influence of the external environment: macro- and microenvironment on the functioning of the industrial enterprise. • Ability to create and implement innovations at all stages of the production cycle, as well as taking into account the life cycle of the enterprise and finished products. • Cost accounting in a way that allows you to use prices that are compatible with the purchasing power of consumers. • Ability to promote goods and services in the market in a more efficient way than competitors. • A number of alternatives for the development of sales activities of the enterprise, which is based on the constant modernization of the world economic system.	• Availability of qualitative characteristics of the enterprise and its environment. • Availability of quantitative indicators for assessing innovative changes. • It is typical to take into account unverified, incomplete, inaccurate, and contradictory information. • The need to identify the hidden needs of mankind. • The need to take into account consumer demands and opportunities. • Based on up-to-date information, which rarely has a statistical basis. and is difficult to trace the dynamics of indicator values. • The need to implement the logical and mathematical relationship of processes and phenomena inherent in innovation.	• rely on thorough research, be meaningful and constructive; • make a forecast based on quantitative data; • analyze the qualitative characteristics of the enterprise and innovative changes; • should represent the logical relationship of formalized and inaccurate characteristics of the studied processes and phenomena; • take into account unverified, incomplete, inaccurate, contradictory information on current and future developments; • analyze current trends and tendencies, explicit and implicit consumer demands, market opportunities, etc.

The ability to achieve innovative goals on the principles of inclusiveness is achieved through research on the latest leading world trends and tendencies, which in turn are the basis for

building a reliable forecast of the selection of areas of development.

We believe that most forecasts are based on the research of information that characterizes the events and the state of the phenomena that occurred, without drawing an analogy with the possibility of certain events, their probability and prospects in general, which can only be expected. Therefore, to build the most probable forecast, it is important to conduct research not only in the study area but also to predict the expected development of events, taking into account all indicators and phenomena of related industries in general and in perspective (Vasilyeva, T., et. al., 2019)

Considering what was mentioned above, for the development of certain socio-economic areas to become innovative and relevant in the international arena, it is necessary to introduce a system of research to effectively forecast and plan future actions taking into account not only macroeconomic and statistical indicators developed in retrospect, and the introduction of analytical analysis of global trends and trends for future directions of development (Churilova E., 2019).

The current stereotype of effective enterprise management is based on the statement that one of the main tools of doing business is the application of innovations in their activities, which in any case will have a positive effect on the management of the enterprise in the future. It is worth noting that only those innovations in any form can be called successful for the enterprise, which meets the main goal of entrepreneurial activity - profit maximization. Given the inclusiveness of economic growth, they must also meet societal needs and challenges. Ways to achieve this goal can have a large number of options, but only those are important, which, revealing the competitive advantages of the enterprise with the lowest costs bring economic effect for the enterprise and social - for society.

The priority of innovative solutions at the enterprise is a broad concept that involves the implementation of such measures, as a result of which the goals of innovation will be achieved with the lowest cost and maximum economic effect (Kondratiuk-Nierodzińska M., 2016). According to Fatkhutdinov R.A. (2002), the main criterion on the selection of an innovative project for implementation are indicators of economic effect and efficiency.

Kozachenko AV et. al. (2010) believe that in the development and further implementation of the results of innovative projects, in addition to indicators of economic efficiency, it is also necessary to take into account the competitive environment in which the company is located. They argue that the competitive environment consists of a set of factors that are interrelated.

Zubenko VO offers its algorithm for determining the priority of innovative projects, where only projects with a positive economic effect are accepted for analysis (Bliznyuk T., 2008).

At the same time, it is expedient to single out the notion of perspective directions of innovative activity of economic objects, which complement the priority ones, revealing a broader essence. Namely, they provide not only the implementation of those areas of innovation that are most successful for him, but also highlight the long-term strategic development of the enterprise, outline balanced steps to implement projects not only for the benefit of the enterprise but society as a whole. the introduction of innovative tools to develop socio-ethical potential, and most importantly - reveal those aspects of innovation that can be the basis for identifying new global trends in the transformation of society and (or) bring the system of innovation to a qualitatively new level.

The scheme of the interrelation of priority and perspectives of directions of innovative development of the industrial enterprise offered by the author has resulted in fig. 4.1.

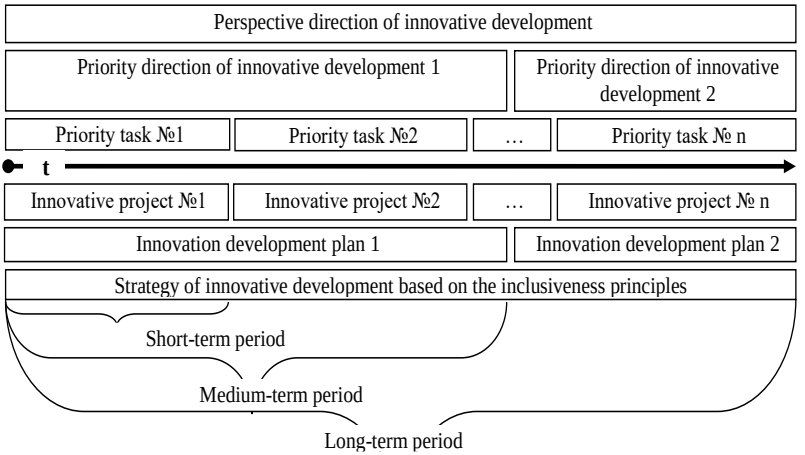


Figure 4.1. The place of the priority and perspective direction of innovative development on the principles of inclusiveness

At the heart of the concept of "perspective direction of development" in the context of forecasting innovation, we laid the principle of long-term orientation in the innovation direction and the nature of the tasks. The meaning of the word "perspective" is focused not only on the future, but also on the activities effectiveness in the future from the occurrence of certain events of the present, which will have a favorable impact. It is practically manifested in the orientation of forecasting innovative development on current and future development trends. This will allow the company to develop successfully in the future (Ginevičius R., 2018).

At the same time, it is expedient to single out the notion of perspective directions of innovative activity of economic objects, which complement the priority ones, revealing a broader essence. Namely, they provide not only the implementation of those areas of innovation that are most successful for him, but also highlight the long-term strategic development of the enterprise, outline balanced steps to implement projects not only for the benefit of the enterprise but society as a whole. the

introduction of innovative tools to develop socio-ethical potential, and most importantly - reveal those aspects of innovation that can be the basis for identifying new global trends in the transformation of society and (or) bring the system of innovation to a qualitatively new level.

4.2 Investment and innovation projects in public-private partnership for inclusive development

As opportunities of traditional models, forms and tools of investment interaction of the state and business in implementation of the partnership approach to investment processes are limited, and then in current conditions the problem of search of innovative mechanisms of investment and innovative projects implementation in public-private partnership. The systematization of the models of cash flows implementation and regulatory actions performed by the author is presented in Table 4.3-4.5.

Model I is a model with a private project management which assumes that a private partner has a possibility to finance a project and manage irrespective of interventions of the representatives from a state sector. State and private partners interact during a limited period of time. To implement this model, the existence of an effective system of monitoring and assessing the effectiveness of public-private investment is necessary. At that, private partners cooperate with the investee and state partners based on a special agreement, which regulates the level of the services rendered to the investee and participation in revenues from the operation of the latter. The execution of agreement controls by the state partner thorough the effective monitoring system and evaluation. In addition, within this model the projects of e-purchasing can be realized in providing public purchases. Such model is acceptable when

the level of capital investments is insignificant and many private investors have a possibility to invest in the project.

A model with a private project management resides in such system of risk accepting and distribution where private partners share all financial risk of the investee and state partners accept only risk of financial control loss and occurrence of social strains, if social needs, for which satisfaction the project is realized, will be filled at insufficient level.

Table 4.3 – Models of cash flows distribution from the implementation of investment and innovative private projects

Model	Organizational features	System adoption and redistribution of risks	Distribution of investment revenues	Application conditions	Implementation area
Model with private project management	A private partner finances the project and manage them irrespective of the state influence. Partners cooperate for a limited period of time on the basis of a special agreement. The state controls only the quality of public services rendered	Private partners share all financial and commercial risks of investment, and state – risk of administrative control loss and the occurrence of social strains	Private partners draw the most of investment income, making payments for services rendered to the state (if receiving of such services is provided by agreement), the scope and necessity of which depend on receiving social effect of the project	The level of capital investment is insignificant or participation of several private co-investors is expected	State Procure-ment System
with fixed payments to the state			Fixed payments reflect predetermined, at the stage of project planning, budget rate and the share of economic benefits, which belongs to the state. Their value is calculated as the difference between the cost estimate of such effects and cost of public services received by private partners	Social effect of the project can be predicted with a high probability	
with variable payments to the state			Variable payments arise in case of obtaining actual social effect compared with the expected project value	Social effect of the project is unpredict-table	

Source: compiled by the author

Table 4.4 – Models of cash flows distribution from the implementation of investment and innovative public projects (compiled by the author)

Model	Organizational features	System adoption and redistribution of risks	Distribution of investment revenues	Application conditions	Implementation area
Model with state project management	Joint public-private investments are carried out. Capital investments (both private and public) are in timed control of private partners	Commercial risk is accepted by private and state partners take administrative risk of the project and the risk of loss of confidence among citizens	The state is a main receiver of investment income and distribute it for private partners. Volumes of payments to private partners are defined using the value of expected socioeconomic effect and correspondence with actual efficiency of investment to predictive estimates	Considerable investment requirements of the project which could not be satisfied by private investments only. The possibility to combine state investments with high efficiency of the private sector in public services delivery for citizens	Large objects in the field of hotel management and health protection; work organization in large airports, railway stations and ports
with fixed payments to private partners	An ironclad agreement is completed between the state and private partners as to the level of satisfaction with social needs, expected social effects. The state fully controls the actions of a private partner		Fixed payments is a part of payments to private partners while the distribution of income on investment and innovative projects implementation, which compensate their expenses on project management on the basis of service-level contract in the light of rate of required return	Income amount does not depend on the amount of services provided by private partners	
with variable payments to private			Private partners receive variable volume of incomes on implementation and also supplementary payments arising when actual social effects are higher then expected	The volume of services provided by private partners, determines total income received by them	

Source: compiled by the author

Table 4.5 – Models of cash flows distribution from the implementation of i public-private project

Model	Organizational features	System adoption and redistribution of risks	Distribution of investment revenues	Application conditions	Implementation area
Model with public-private project	The joint public-private project financing. As a rule, the project is operated by a private investor. Private partners are provided a sufficient level of autonomy in decision-making	A uniform distribution of risks between partners. A violation of uniformity in risks distribution is compensated in the process of investment incomes distribution	Investment income is distributed according to the partner's contribution in the formation of the primary volume of the capital investments with the level of acceptable risk	Projects that require significant capital investment	Oil refining, gas production, electrical energy industry et al.
with fixed payments to the stat			Fixed payments reflect preliminary stated, on the stage of project formation, value of expected effect, which belongs to the state. Their value is calculated as the difference between the estimated value of such effects and the estimation of state services received by private partners	Socioeconomic effect of the project can be predicted with a high probability	
with variable payments to the			Variable payments arise in case of reduction of actual effect compared to expected project value	Socioeconomic effect of the project is unforeseen	

Source: compiled by the author

Accordingly, while distribution of investment incomes, it makes sense to private partners to portion larger fraction of incomes, correcting state payments to the volume of received positive social effect. It causes the division of cash flows received by the state, on a permanent and variable part. Fixed payments reflect predetermined, at the stage of project planning, budget rate and the share of economic benefits, which belongs to the state and variable payments arise in case of receiving actual social effect compared with the expected project value. As a matter of actual practice, the use of two modifications of a specified model is possible: only with fixed or variable payments to the state.

In model II – the models with a state project management, capital investments which are made by the state and business (an investee), are within the jurisdiction of a private partner. This model is especially effective when the state wants to use the effectiveness of a private sector in the supply of essential services for citizens. Private investors do not have money in plenty to invest in large-scale projects. That is why this model provides the combination of government opportunities for investing significant financial resources together with the ability of effective private project management, which allows achieving significant positive results.

All financial risk in this model is accepted by the state. In addition, state partners take the administrative risk of project failure and the risk of confidence among citizens. In this way, an ironclad agreement is completed between the state and private partners as to the level of satisfaction with social needs, for which a public-private partnership is organized, and expected social effects.

The state is a main receiver of investment income in a model with a state project management and performs its redistribution in favor of private partners in the form of fixed and variable payments. The volumes of fixed and variable payments to private partners is determined by a value of expected socioeconomic effect and correspondence with actual efficiency of investment to predictive estimates.

The model with a state project management also has two modifications. In the first instance, private partners receive a variable amount for accumulation of revenue. Otherwise, they get a fixed sum to manage a project based in agreement on a service level. In case when revenue generation unrelated to services, supplied to private partners, the model with fixed payments is used. However, if services, which are provided to private partners, is influenced the process of return generating

directly, then the model based upon variable payments is applied.

Model III – a model with a public-private project management most corresponds to the basic principles of state and business interaction, as it tries to distribute risk and socioeconomic effects between partners equally. Both parts of partnership relations – state and business – invest capital investment in project financing.

The profit is distributed in accordance with initial volume of capital investments, as well as corresponding to the risk level, accepted by a responsible partner. This model tries to distribute risks and investment income among partners on an even basis.

The availability of fixed payments only or variable payments to the state forms two separate modifications of this model. At that the conditions of formation of fixed and variable payments are identical to the approach, which was proposed to implement while the description of the model with a private project management.

It is desirable that the project was managed by a private investor in order to use its efficiency and past experience of a business dealing of that kind. Using this model the most beneficial would be to organize financing of projects in public-private partnership, which demand a significant volume of capital, such as oil refining, gas production, electrical energy industry et al.

Based on explored and generalized global experience, the models of organization of cash flows and regulatory actions, which can be effectively used in domestic practice to improve the effectiveness of public-private cooperation, are proposed. In our view, their implementation provides relationship between investment benefits gained by partners with volumes of furnished capital, the level of accepted investment risk, service level, concerning the satisfaction of social needs.

Suggested models can become the blueprint for cash flow construction and risks distribution from implementation of investment programs and projects on condition of public-private partnership in Ukraine.

4.3. The role of social and responsible finance in the formation of post-crisis financial architecture and its impact on inclusive growth

During the overcoming the effects of the global financial crisis of 2007-2009, new crises caused by local economic recessions and the coronavirus pandemic, key issues of financial science started to focus on the ability of a financial system to function effectively, counteract external shocks and support sustainable development.

Despite the discussion in the scientific community regarding the concepts and hypotheses of financial crises (cyclical (Kitchin cycle, the Juglar cycle, the Kuznets swing, Kondratiev waves), stochastic (F. Kydland, E. Prescott, N. Taleb), the "overproduction" crisis, managed crisis, their consequences are destructive for social security programs, reduce social standards and quality of life.

The outlined number of issues is topical and addressed for searching alternative concepts of the formation of the post-crisis architecture of the financial system and adequate state investment and finance policy, taking into account their social origin. One of such concepts, in our opinion, can be social finance as one branch of financial science, which operates not only the categories and classical finance indicators but also combines them with social phenomena and processes.

Based on the above-mentioned facts, in this chapter, we consider the main features of the current global financial system, as well as the characteristics of the social finance development in the context of post-crisis reform of its structure.

The main features of the modern global financial system are the following:

- the priority of the neoliberalism concept: lack of levers of supranational regulation, adequately suitable to the scale of financial flows and markets; information asymmetry, moral hazard in making investment decisions; non-transparency of financial markets and operations of their main participants;
- financialization of the world economy: distribution of complex financial products within the priority field of financial engineering; producing significant amounts of speculative capital and the separation of the financial sector from the real; development of the shadow banking system.

We describe each of these features in the context of their impact on social security and welfare.

The distinctive feature of the modern global financial system is its foundation in the form of the neoliberalism concept, which gives priority to market regulation. Hence, with the intensification of the capital flows and deregulation of the banking systems in the world, national regulators have lost control over the conditions of financial systems. Moreover, oligopolistic industries, such as the rating and auditing businesses, have contributed to growing information asymmetries and moral hazard for investors of the financial market due to high levels of conflict of interest. Lack of accounting methodologies of financial instruments and technologies, the rapid development of over-the-counter markets have led to low transparency of financial systems.

In the complex, these features are embodied in the world economy financialization. Foreign authors define financialization as the growth of systemic power and financial engineering, the transfer of the economic activity of economic entities from production (or from a more dynamic sphere of services) to the financial system (Blackburn, 2006; Foster, 2007).

In general, financialization can be described as the process of strengthening the dominance of the financial industry in the

world economy, financial auditors in corporate management, financial assets, stock markets, financial market fluctuations as a determinant of business cycle (Dore (2008). The result of this process has become financial bubbles, each of which can be larger than the previous one, and generates a huge financial superstructure over real production (Namcoon Sok (2010).

At the same time, the financialization is characterized by an increase in volume, complexity of financial activities and financial products, the human investment capital outflow into the financial industry, and so on. In addition, the financial system deregulation, the emergence of new financial engineering technologies and opportunities for free capital flows have led to a growth of the number of quasi-banking institutions that provide financial services but they are not regulated.

The presence of speculatively oriented and unregulated financial system provokes the global financial crisis, decrease the level of social security and living standards. The role of social finance is becoming more essential due to the growing need for various types of social benefits and payments during the crisis.

Social finance recently exists as an independent branch of financial science. It has an underdeveloped methodology and is characterized by controversial approaches to the formation of a categorical set. There are different interpretations of their definitions. Pasichnyk (2006) formed the basis for the social finance study as a separate branch of public finance, which integrates the instruments of finance, sociology, psychology, methods of the systems approach and synergetic. Shakhayev (2006) defines social finance as funds of funds formed and used by social ministries and departments of federal and regional level, as well as social departments of local administrations, which are formed through social taxes, expenditures on social needs from the budget and extra-budgetary funds.

All approaches to the definition of social finance allowed giving them a descriptive characteristic, using their key features:

- as an ideology of functioning of the financial system (funds are used not for speculation, enrichment, but to achieve a positive social effect, helping society and the environment);
- as a tool for financial support, developing a financial strategy and business model of non-profit organizations that provide social services, which increases its financial stability;
- as a technology of budget management (through giving access to non-profit organizations to public procurement, the state provides direct support to the social sphere);
- as a model of functioning of enterprise, bank, which provides a combination of traditional business with a philanthropic component, ethical investment, socially responsible entrepreneurship.

Using a deductive approach, it should be noted that finance and social finance are correlated as general and partial. Moreover, finance is a conceptual basis, as evidenced by their comparative characteristics.

When we talk about social (responsible) finance, we define it as formed and used by social ministries and departments at various levels, as well as departments of entities and social departments of local administrations

Despite the different approaches to the interpretation of the definition and role of social finance, it should be emphasized that during the post-crisis period their use as an independent branch of financial science intensified and embodied in a number of prevailing trends in their development:

- the emergence of a separate sector – the economy of social welfare (social solidarity);
- converge of interests of ethical companies and ethical investors and their registration on social exchanges;
- the emergence of specific institutions that use the ideology and technologies of social finance such as B-corporations and "community" banks and specific financial instruments (social impact bonds);
- the emergence of alternative and auxiliary currency systems.

We fully consider each of them. Researchers of social finance define in the most general form the interpretation of this category as the supply of funds to organizations aimed to solve socially significant problems, as well as the search and accumulation of such funds as fundraising. At the same time, during the search, accumulation, supply and use of funds for social needs economic relations between the entities of the financial system arise. Generally, the emergence of a system of economic relations is not limited to social finance but allows us to talk about the social economy that is the economy of social welfare and solidarity.

The existence of an independent sector of the economy seems somewhat premature today, but official statistics convincingly show its significant potential. For example, in most countries OECD, up to 10-15 % of budget funds invested in the education, health care and social protection services by non-state social service organizations Sheiman (2012 a).

Non-profit organizations play an important role in the functioning of the public procurement system in these countries. The share of budget funding in the total revenue of non-profit organizations on average in the group of Western Europe, Canada and Israel reaches 54 %, Eastern Europe is 42 %, Anglo-Saxon countries – 36 %, developed Asian countries – 34 %, Latin America –19 % Sheiman D. (2012 a).

Despite the global trend of increasing of such funding, in In Ukraine and the Russian Federation, the share of funding non-state social service organizations from budgets at various levels does not exceed 5 %.

Giving the advantages of "financial support-social effect", especially in the context of the real sector of the economy out of the crisis, we can highlight the main fields of strengthening the social economy sector:

- increase of the capitalization of non-profit enterprises providing social services;
- promotion the development of additional, alternative financial and monetary systems that drive the social economy;

- stimulation of social partnership, socially responsible business, ethical investment.

Concretization of these directions is achieved through the formation of the institutions, instruments and technologies of social finance. One of such institutions is the social stock exchange.

It should be pointed out that projects that require funding are carefully selected. This procedure ensures the transparency of the exchange.

Similar principles are established in the work of the South African Social Investment Exchange (SASIX) opened in 2006.

Projects are admitted to trading on the stock exchange, taking into account the strategy aimed at solving a social problem, a management system directed to the result and the priority of sustainable development of the organization (the project initiator).

Some social stock exchanges are developing in Singapore (Impact Investment Exchange Asia (IIXA)), the USA (Green Stock Exchange), Great Britain (London Social Stock Exchange), Portugal and Germany.

The development of such exchanges, in our opinion, can be an effective measure in reforming the existing infrastructure of financial markets, given the need to reduce the volume of over-the-counter markets, as well as derivatives.

Important participants who need access to such exchanges are the so-called B-corporations and "community" banks.

The postulate that defines the work of B-corporations, whose mission is to promote positive social change, is the use of opportunities of private enterprise to create public goods. Philanthropy, social responsibility is the foundations of the business model of such enterprises, which determine their financial and production strategies.

It is noteworthy that the line between social enterprises as non-profit organizations providing social services and B-corporations as companies conducting business based on ethical

models is quite thin. But the importance of such enterprises in strengthening the real sector of the economy and meet specific social needs of the population is exceptional in the process of reforming the global financial system.

With growing mistrust to the banks responsible for the crisis, community banks have taken a special place in the financial system. These include private financial institutions that operate locally in small towns and serve a community where the personal relationship between the bank's management and its customers is valued.

The defining features of such banks are the following:

- the financial policy of the bank is aimed at satisfying the interests of the community and achieving positive changes in it;
- personal relations between community members and the bank's management contribute to the establishment of flexible and more favorable conditions for customers on the one hand and minimize the risks of the bank on the other;
- being in touch with the client to reduce the bureaucratic procedures;
- a significant role in the formation of resources for charitable and non-profit organizations working for the community goods;
- creation and promotion of own charitable funds to use community funds with maximum efficiency for the community itself.

Social Impact Bond (SIB) is an innovative financial instrument that allows attracting private capital to the non-profit sector and links income to solving social problems.

A social impact bond is a contract under which investor invests in a particular social project. If the project is successful and certain social improvements are achieved, the private investor is reimbursed (by the state), and possibly with a bonus. That is why SIB has another name – "Pay for Success". The first experience of placing social impact bonds "One" was carried out in the UK since September 2010 in the field of criminal justice by Social Finance organization (Fedosova E. (2012b).

Participants of social impact bonds are the investor (usually ethical or socially responsible), the authority (e.g. municipal), citizens and the "supplier" or "producer" of socially important services.

The interaction between these participants is organized as follows:

- at the first stage the authority and the investor determine specific, measurable project results that are positive for society and the method of their evaluation;
- at the second stage, the investor invests in a company that provides social services in which the government is interested;
- at the third stage the project is worked out;
- at the fourth stage, the government body evaluates the project achievement and the results. In case of a positive assessment, a decision is made to reimburse the investor's expenses from the state budget; in case of negative the investor does not return the money.

Such an interaction is reflected in the close relationship between the achievement of concrete results for the society and a certain reward for the investor.

It should be noted that social impact bonds can become an alternative financial instrument in the conditions of discrediting super-complex financial engineering instruments, derivatives, credit derivatives, etc. in the conditions of accumulation of speculative capital.

The separation of the financial sector from the real under the globalization of the world economy and the speculative origin of financial markets transactions (over 90 % of transactions are made for speculative purposes) allow us to conclude that existing monetary systems create favorable conditions for increasing speculative capital due to their uncontrolled and unsecured emissions. It can be used as an instrument to negatively affect the economy and financial market of a certain country.

In contrast to traditional monetary systems, alternative monetary systems operate within the real sector of the economy.

They force the currency flow from environmental and socially useful sources.

Complementary currency systems are in circulation separately or combination with national currencies. The geography of their circulation can be both national (then they are called "parallel currencies") and regional ("local currencies") or network ("community currencies").

Thus, during the post-crisis reform of the global financial system, important attention is paid to a new concept of social finance. It is concretized in the emergence of the social economy, the spread of ethical investment and socially responsible business by social stock exchanges, B-corporations, "community" banks with using specific financial instruments such as Social Impact Bonds within the alternative monetary systems.

The use of social finance schemes and technologies is an effective instrument in overcoming the effects of the global recession, problems in the development of the financial and real sectors, reforming the architecture of the financial system as a whole, and in improving people's quality of life, social standards and security.

Given the short time of development the methodology of social finance in developed countries, Ukraine is taking only the first steps in this direction. The draft law "On Social Enterprises" is formed to create an institutional base for social entrepreneurship within the private sector and promote social policy. Accordingly, social finance as a separate branch of financial science and the social economy as a separate sector of the economy has significant prospects for development.

5. THE EFFECTS OF SHADOW ECONOMY ON INCLUSIVE GROWTH

5.1 Risks of shadow economy by economic agents: economic and social aspects

Current trends in economic development are characterized by instability of economic activity, budget deficits, low efficiency of economic, political and social reforms, increasing the level of losses of enterprises, high levels of corruption and others. The transformational changes that have recently been observed in the world are taking place under the influence of exogenous and endogenous factors, which, on the one hand, are stimulators of these processes and, on the other hand, deepen economic imbalances. One of the most influential destabilizing factors today is the shadowing of the economy. According to the International Monetary Fund, in 2018 the average global level of shadowing of the national economy is about 25% of world GDP, and in some countries, this level exceeds 35% of GDP.

One of the inhibitors of economic growth caused by the shadow economy is the evasion of economic agents from fulfilling their tax obligations, which leads to a deterioration of the macroeconomic situation in the country. Research by foreign scholars shows that the total annual tax gap in the European Union for all taxes is 825 billion euros (about 20% of tax revenues), and in non-EU countries, this level exceeds 30%. Based on this, as one of the basic financial and economic components of the state policy of de-shadowing of the economy, it is necessary to consider a timely and thorough assessment of the risks of shadowing of the economy.

The aim of this research is to identify the factors that encourage the shadow activity of economic entities, to assess the risks of their occurrence and predict future economic losses depending on the scenario in the country's development.

The results of the analysis of scientific works of domestic and foreign scientists indicate a significant transformation of

approaches to understanding the content of the shadow economy and the variety of names of this concept.

In order to study the main trends in the development of the theory of shadow economy, a bibliometric analysis was performed (using VOSViewer v.1.6.10), the object of which was 1,609 scientific articles on this issue, most of which were published in 2010-2020 years in journals indexed by the scientometric database Web of Science. in this issue).

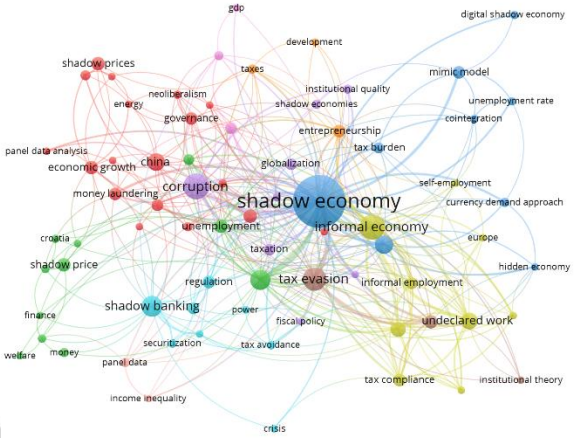


Figure 5.1. Results of bibliometric analysis of scientific papers on the theory of tax gap management for 2010–2018 in publications indexed by the scientometric database Web of Science (VOSViewer toolkit v.1.6.10)

According to the results of the analysis of the frequency of use of keywords in scientific works, eight structural-functional patterns have been identified. They show that most often the issue of de-shadowing of the economy is studied in close connection with the following theories:

1) the theory of anomie considers economic crimes as a result of the decline of generally accepted norms in society, the reaction of the individual to excessive pressure from society by setting requirements for his behavior (Durkheim, 1989). Representatives of this theory argued that the pressure leads to

non-compliance with statutory rules of economic activity, tax evasion, deformation of economic processes and increasing social tensions in the country. Thus, the authors conclude that there is a need for a policy to counter deviant behavior among taxpayers.

2) according to the theory of modernization, the informal sector is the result of the lack of positive economic changes in the country. The low level of economic and social development necessitates the search for alternative options for obtaining economic benefits (Geertz, 1963; International labour organization, 2011). The authors identified the low level of education and moral values in the country as the most influential factor in the emergence of the shadow sector.

3) the theory of dependence (Hart, 1973; Portes & Schauffler) considers the informal sector as a tool for livelihoods for the economically vulnerable. Its main characteristics are virtually no competition and, accordingly, easy entry into the market, low profits, low level of technological equipment of production, informal employment, mainly within the family.

4) representatives of neoliberal theory associate the shadow economy with a high level of fiscal burden in the country (De Soto; Nwabuzor, 2004), excessive state control and strict regulation of all economic processes. The transition from the formal to the shadow sector is forced actions of economic entities aimed at saving time, money and effort due to the imperfection of public policy and the complexity of the declared procedures for doing business.

5) the theory of political economy (Castells & Portes, 1989; Cuervo-Cazurra & Dau, 2009; North, 1990; Slavnic, 2010) is to understand the shadow economy as a consequence of insufficient state intervention in the processes of economic and social development of the country. The low quality of financial monitoring processes for the transparency of economic transactions, the lack of state control over the activities of economic entities contribute to the growth of shadow financial flows in the country.

6) according to the theory of tax morality (Alm & Torgler, 2006; Bonner & Spooner, 2011; Daude et. al, 2013; Kastlunger et. al, 2013; Lago-Peñas, 2010; Martínez-Vázquez & Torgler, 2009; Williams & Martinez, 2014) the level of shadowing of the economy primarily depends not on the economic indicators of the country's development, but on moral norms that prevail in society.

7) institutional theory explains the informal sector of the economy by the imbalance between the moral norms of formal and informal institutions in the country (Baumol & Blinder, 2008; Helmke & Levitsky, 2004; North, 1990). Proponents of this theory claims the duality of the rules governing the behavior of economic agents. For example, Layosa (1996) and Feige (1990) argue that institutional constraints are a catalyst for the formation of the shadow sector of the economy.

8) the theory of structuralism considers the shadow economy as an alternative, consistent and natural form of development of economic relations, which is the result of a structural crisis in the economy, low social guarantees in the labor market and so on. The advantages of the informal sector are significant savings in production costs and low cost of goods produced in it.

Systematization of existing theories of shadowing of the economy helped to identify the main risks of increasing the share of the shadow sector of the economy.From an economic point of view, one of the biggest risks of the shadow economy is the formation of tax gaps due to the evasion of economic entities' tax obligations, which leads to a reduction in budget revenues and program funding. Tanzi (1191) and Schneider (2006) argue that one of the biggest negative consequences of the shadow economy is a reduction in the tax base and, accordingly, a reduction in budget revenues, which ultimately leads to a constant ineffective increase in tax rates.

Layosa (1996) came to a similar conclusion. With the growth of the shadow economy, access to public services for citizens decreases, and the shadow economy itself reduces government

revenue, leads to less ability to provide high-quality public goods, inefficient allocation of resources, reduces the quality of life.

Similar conclusions were reached by Schneider, & Klinglmair (2004), and Kirchler (2007), who argued that the shadow economy is an obstacle to economic growth and distorts the country's development.

The biggest negative effects of the shadow economy on the level of social development of the country include evasion of social contributions, which leads to a significant reduction in funding for social security programs and measures, problems with social benefits, state pension system, unemployment insurance, health insurance, etc. The pace of reforming the sectors of health care, education, social protection, etc. is declining.

In assessing the relationship between the informal economy and the country's social development, most authors use indicators of the quality of life of society as the number of secondary and higher education institutions, the density of hospital beds, kindergartens, the level of education of the population and others as indicators affected by shadow operations. However, in our opinion, these indicators characterize the social development of the country as a whole and do not fully reflect the change in the level of "quality of life" of society under the influence of shadow operations.

Katrechka and Dahlberg (2014) studied the relationship between these indicators in the long run by evaluating 4 econometric models, in which the level of shadowing of the economy was used as a factor, and as the resulting indicators - life expectancy, HIV prevalence, school enrollment and mortality up to 5 years.

Quantitative empirical studies for 31 countries with a high level of economic development and 27 countries with a medium level confirmed that the negative effect of the shadow economy outweighs the positive one in the social sphere for all analyzed countries. The change in the level of the shadow economy by

1% is more negative for countries with low and medium levels of development than for developed countries.

The greatest negative impact is observed on life expectancy, school enrollment, and mortality of the population under 5 years of age. The shadowing of the economy has a very small positive effect on the HIV prevalence rate (Katrechka & Dahlberg, 2014). For example, with a 1% increase in the shadow economy, the mortality rate under the age of 5 will increase by 4.66 children per 1.000 births. This is the largest dependence compared to other variables. Increasing the shadow economy by 1% will reduce the prevalence of HIV by 0.12%. Therefore, the prosperity of the shadow economy may have a small positive effect on the prevalence of HIV.

As shown in Figure 5.2, the impact of shadowing on GDP does not depend on the share of the informal sector of the economy, while the level of out-of-school education decreases with its growth.

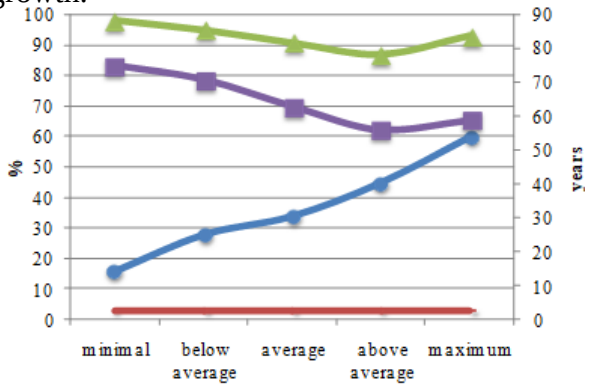


Figure 5.2. Relationship between the shadow economy and quality of life indicators
Source: developed by authors based on WDI

Illegal shadow activity has no less impact on the quality of the country's institutional development. Bovey (2002) found that during the 1990-2000s, the OECD countries had a negative relationship between the shadow economy and the quality of the

institutional environment. Terasawa and Gates (1998) claimed that less developed countries have a positive relationship between government size and economic growth in the official sector, whereas developed countries have a negative relationship between these indicators.

The relationship between the shadow economy and the Human Development Index (HDI) was partially investigated by Amendola and Del Anno (2010). The authors found a U-shaped statistically significant negative relationship between the shadow economy and the HDI for Latin American countries (Figure 5.3).

The shadow economy is quite strongly linked to the spread of corruption in the country. Corruption is one of the most important drivers of shadow economy. At the same time, there is many empirical evidence of the feedback between these indicators. Thus, Dreger and Schneider (2006) conclude that the shadow economy and corruption are substitutes in high-income countries, while in low-economic-growth countries they supplement and stimulate each other's growth.

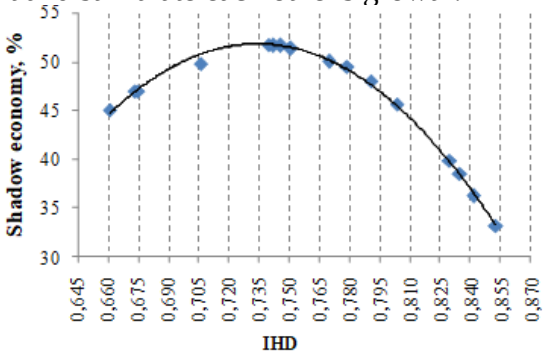


Figure 5.3. Quadratic relationship between HDI and shadow economy on the example of Latin America
Source: developed by authors based on Amendola (2010)

Hindriks, Keen and Muthoo (1990) argue that corruption is an integral part of the shadow economy. At the same time, the authors point out that the shadow economy, depending on the

level of economic development, material well-being of the population and other factors, may have different nature and degree of influence on corruption.

Today, the problem of high unemployment is quite acute for most countries with medium and low economic development. Some scientists attribute the economic crisis to the main causes of this situation, which leads to reduced production and bankruptcy of business, automation of production processes, low wages, etc. However, the shadow sector of the economy also plays a significant role in this.

According to the analysis made by Chrenekova et al (2016) there is a negative correlation between the level of informal employment and quality of life indicators in the regions of Ukraine. In regions with high levels of informal employment, most households identify themselves as poor. With the decline in income (average monthly wage), the share of informal employment increased. The authors conclude that in regions with a higher share of informal employment have created conditions for reducing unemployment. At the same time, informal employment does not increase the level of material well-being of the population.

Kacher (2011) argues that informal cross-border trade in Zimbabwe is a positive contributor to poverty reduction. This result was obtained by improving the socio-economic well-being of traders and improving their food security.

As a rule, informal employment has its advantages and risks for workers and employers. Informal workers are deprived of social benefits or have limited access to them. They often depend on social programs targeting low-income groups or programs that depend on the political commitment of the government. At the same time, shadowing has a statistically significant direct impact on the level of material well-being of the population.

Shadow labor relations have a negative impact on the level of social protection. Thus, shadow employment does not provide for formal contractual labor relations and social protection of workers. This is primarily due to the fact that these activities are

not accompanied by the emergence of tax liabilities for these employees. Employers do not pay social security contributions and taxes related to employment, although they may meet their tax obligations on other payments. The relationship between the formal and informal sectors of the economy can be represented as a matrix, which at the level of social protection involves moving diagonally from the lower left corner to the upper right corner when changing the nature of labor relations from formal to informal (Figure 5.4).

In general, there are three models of employee behavior:

1) *Quadrant 1.* Formal employment, characterized by full declaration of income and fulfillment of obligations. Such an employee is the most protected both economically and socially. In addition to the official salary, the minimum level of which is clearly defined by law, this employee has the legal right to leave, social benefits, under the conditions specified by law, pension benefits in amounts that correlate with the level of his salary. At the same time, such relations provide for full payment by business entities in full of the single social contribution and personal income tax.

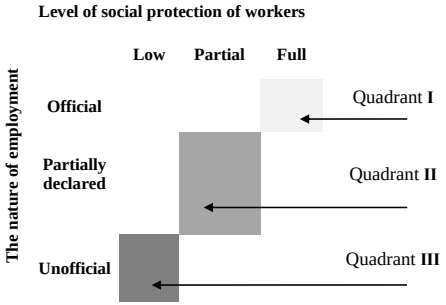


Figure 5.4. Matrix of the ratio of formal and informal labor market

2) *Quadrant 2.* Official employment, the feature of which is the partial declaration of income. This category includes employees who work in officially registered companies that pay

taxes, have accounts, keep accounting and tax reporting, but receive part of the salary in "envelopes". This reduces the tax liability of the economic entity. Under this type of relationship, the employee retains all rights, as for the first category of employees. At the same time, this may affect the number of their future pension benefits.

3) *Quadrant 3.* Informal employment can be carried out both at officially registered enterprises and illegal ones. Quite often the size of wages in the shadow labor market is larger than the official sector of the economy. At the same time, these workers are deprived of any social guarantees and benefits, which in the unstable economic environment in the country makes them most vulnerable to changes in the macroeconomic situation in the country.

According to the data shown in Figures 5.5-5.6, the shadowing of the economy has a statistically significant indirect impact on the level of material well-being of the population.

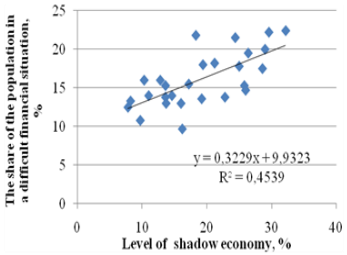


Figure 5.5. The relationship between the share of the poor and the size of the informal economy

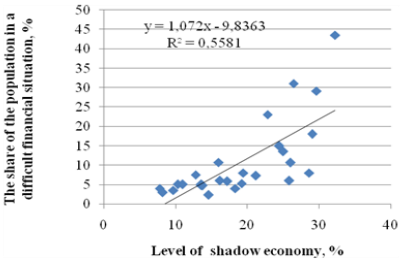


Figure 5.6. The relationship between the share of the population in a difficult financial situation and the size of the informal economy

Individuals dependent on the informal economy are particularly vulnerable to such risks. Although quite often this category of the population may prevail in society, in terms of social protection, they are often marginalized in society.

Participants in the informal labor market generally do not have social security or have limited access to it. They often depend on social programs aimed at the poor, programs that depend on the political commitment and will of the government.

As a rule, the shadow labor market is characterized by the lack of official registration of a person as a business entity and therefore does not provide for the presence of a body that protects the rights of workers (trade unions in the enterprise, etc.). This leads to an increase in cases of non-fulfillment by employers of their obligations regarding timely and full payment of wages, compliance with safe working conditions, labor discipline, legal requirements for the work schedule, etc.

To study the risk of negative impact of shadowing on the economic and social development of the country, the following hypothesis was put forward: the increase in the level of shadowing reduces the amount of tax revenues to the budget, which affects the financing of economic and social development programs and worsens the country's development indicators. To test this hypothesis in the paper:

1) the cause and effect interdependencies are formalized in the chains “shadow economy - the amount of tax revenues (TR) - the level of GDP” and “shadow economy (SE) - average wages (S) - the volume of social contributions (SC) - coverage of social protection and labor programs (CSP)”;

2) a methodology for estimating the duration of a lag, during which the existing state policy to de-shadowing of the economy can compensate for all or most of the negative consequences that are cumulatively accumulated has been developed (assuming that the current system of counteracting the shadow economy, taxation and allocation of budget allocations does not change in the country).

Within the framework of the test of this hypothesis, it is assumed to determine the stationarity or non-stationarity of series of data using the Dickie-Fuller test and to estimate the presence of their cointegration (Johannsen test). In case of stationary data series is applied VAR method. In case of non-

stationarity and cointegration, the vector error correction (VEC) model will be used.

In order to test the hypothesis about the relationship between the level of shadow economy and economic and social development indicators, we will conduct a regression analysis of their relationship. According to the results of the calculations (table 5.1), all indicators show a close relationship with the level of shadow economy (the constant was rejected in the estimation process).

Similar results were obtained for the rest of the analyzed countries. At the same time, it should be noted that despite the high index of statistical significance (0.99), the obtained values of the regression level are considered to be statistically significant, since they do not take into account the possibility of indirect influence on the resultant index due to its direct effect on other factors.

Table 5.1. Regression estimation between factors of c Poland 's development and shadow economy

SE	*Coef.*	*Std. Err.*	*t*	*p > I t I*	*[95% Conf. Interval]*	
TR	1.3602	.006863	202.877	0	1.3447	1.3757
GDP	8.3088	.229494	37.0543	0	7.7896	8.8279
S	1.4569	.007608	196.029	0	1.4397	1.4741
SC	3.2202	.019219	171.514	0	3.1767	3.2637
CSP	1.3307	.006714	198.477	0	1.3155	1.3459

In order to test the hypothesis of the relationship between the determined indicators, we will analyze the series of data for stationarity using the Dickie-Fuller test based on Stata 14. It is assumed that the data used will not be stationary. The results of the single root test for Poland's social development indicators are shown in the table 5.2.

The calculations for all data showed an excess of t-statistic values above all critical values (1, 5, and 10%). The results of the test for the presence of single roots of Dickie-Fuller concluded that the non-stationarity of the analyzed series of data.

Table 5.2. Dickey-Fuller test results for unit roots for Poland for SE and indicators of social development

	Test Statistic	*1% Critical Value*	*5% Critical Value*		*10% Critical Value*	
Z(t)	-1.190	-3.750	-3.000		-2.630	
D.SE	Coef.	Std. Err.	t	p > I t I	[95% Conf. Interval]	
SE						
L1.	-.29244	.24581	-1.215	.3268	-1.074	.4898
LD	-.04897	.48600	-.1021	.9458	-1.595	1.4977
L2D	.02207	.81452	.0306	1.0010	-2.5701	2.6142
_cons	3.5461	.81452	1.1950	.3309	-6.072	13.164

To establish the coherence of the series of data, we will check for the presence of single roots of their first differences using advanced Dickie-Fuller regressions. The analysis showed the absence of single roots of the first differences for all indicators, and made it possible to conclude on the cointegration of the series.

The next step is to determine the number of lags and their significance (Table 5.3).

Table 5.3. Results of the Dickey-Fuller test calculation (fragment)

		Poland	Germany	Italy	Romania	Ukraine
SE	Test Statistic	-1,56	-1,26	0,26	-0,38	1,56
	1% Critical Value	-3,75	-3,75	-3,75	-3,75	-3,75
	5% Critical Value	-3	-3	-3	-3	-3
	10% Critical Value	-2,63	-2,63	-2,63	-2,63	-2,63
	p-value	0,52	0,66	0,99	0,93	1,01
Sal	Test Statistic	-1,44	1,86	0,56	-1,72	-1,50
	1% Critical Value	-3,75	-3,75	-3,75	-3,75	-3,75
	5% Critical Value	-3	-3	-3	-3	-3
	10% Critical Value	-2,63	-2,63	-2,63	-2,63	-2,63
	p-value	0,58	1,01	1,00	0,43	0,55
SC	Test Statistic	-1,20	0,86	-0,42	-0,51	-1,22
	1% Critical Value	-3,75	-3,75	-3,75	-3,75	-3,75
	5% Critical Value	-3	-3	-3	-3	-3
	10% Critical Value	-2,63	-2,63	-2,63	-2,63	-2,63
	p-value	0,69	1,00	0,92	0,90	0,68
CSP		-1,32	-0,40	-0,42	1,74	0,08
	1% Critical Value	-3,75	-3,75	-3,75	-3,75	-3,75

		Poland	Germany	Italy	Romania	Ukraine
CSP	5% Critical Value	-3	-3	-3	-3	-3
	10% Critical Value	-2,63	-2,63	-2,63	-2,63	-2,63
	p-value	0,64	0,92	0,92	1,01	0,98

The results of calculating the time lag of the effect of factor indicators on the resultant for the analyzed countries showed that for the vast majority of countries the time lag is either absent or correlated in the first year. The calculation fragment for Poland is shown in the table 5.4. Since for some of the analyzed indicators, the t-statistic value approaches the critical values, we will test the reliability of the obtained results using the Johansen test. The obtained P-values of this test indicate the cointegration of the series and the presence of one cointegration ratio for all analyzed countries.

Table 5.4. Test results for determining the importance of lags (on the example of Poland)

lag	*LL*	*LR*	*df*	*p*	*FPE*	*AIC*	*HQIC*	*SBIC*
0	62.3	-	-	-	1.3e-15*	-19.8	-19.8	-19.3
1	958.8	1793.0*	25	-	-	-323.0*	-314.0*	-311.0*
2								
3	949.6	-	25	-	-	-306.9	-310.9	-307.9
4	955.2	11.29	25	0.9	-	-308.8	-312.8	-309.8

The results of determining the time lags of the correlation between the factor and the result indicators showed that in some countries there is a connection with a specific time lag (different from the results of table 5.5). The reason for these differences is that the latter takes into account the nature and vectors of relationships for all the analyzed factors in the aggregate, while in the regression analysis the relationship with each factor is evaluated in more detail rather than as a whole.

Considering the presence of non-stationary and co-integrated data series, the next stage of evaluation will be the transformation of the used data into stationary ones and their subsequent evaluation by constructing a VEC model. Based on the VEC estimation of the model, we can conclude that in the long run the level of shadowing of the economy harms GDP,

while the amount of tax revenue has a positive impact. The coefficient of statistical significance is at the level of 1%.

Table 5.5. The result of the Johansen test on the series cointegration for Poland

minimum rank	*parms*	*LL*	*eigenvalue*	*trace statistic*	*5% critical value*
0	30	43.7863		59.8547	57.50
1	35	52.0368	0.85478	25.5713	49.15
2	38	56.7150	0.72156	17.9688	32.91
3	41	59.8950	0.52145	9.5874	15.85
4	44	64.9631	0.32145	0.0121	4.58
5	49	65.3077	0.00012		
maximum rank	*parms*	*LL*	*eigenvalue*	*trace statistic*	*5% critical value*
0	30	403.7863		57.9530	52.36
1	35	502.0368	0.85478	21.9012	45.49
2	38	568.7150	0.72156	15.0682	28.64
3	41	596.8950	0.52145	9.5125	15.05
4	44	646.9631	0.32145	0.0121	4.58
5	49	655.3077	0.00012		

Table 5.6. Results of regression constructing with the assumption of the constant absence (on the example of Poland)

SE	*Coef.*	*Std. Err.*	*T*	*p>I t I*	*[95% Conf. Interval]*	
TP	4.1997	1.5221	-1.82	0.10	0.475	7.924
GDP	-3.5576	1.8746	2.64	0.03	-8.144	1.029
Sal	0.5098	0.9347	0.53	0.58	-1.777	2.797
SC	1.1052	0.2924	1.62	0.01	0.389	1.820
CSP	1.8100	0.4790	4.93	0.01	0.637	4.982

Table 5.7. Separate characteristics of regression models with Lag 0 and 5 (fragment)

	lag	*The value of t-statistics*			*R-level of significance*			*The value of t-statistics*		*R-level of significance*	
		Sal	*SC*	*CSP*	*Sal*	*SC*	*CSP*	*5%*	*10%*	*5%*	*10%*
Ukraine	0	1.62	-1.57	2.52	0.13	0.14	0.03	2.14	-2.07	0.18	0.19
	1	0.34	-1.05	1.65	0.70	0.31	0.14	0.45	-1.38	0.93	0.41
	2	0.14	-0.94	2.35	0.85	0.36	0.07	0.19	-1.24	1.12	0.48
	3	1.21	0.01	0.43	0.28	0.94	0.65	1.60	0.01	0.37	1.25
	4	0.90	-0.54	0.07	0.42	0.60	0.90	1.19	-0.72	0.56	0.79
	5	7.96	-8.80	1.53	0.07	0.07	0.34	8.84	9.76	0.08	0.07

Germany	0	0.13	5.20	1.42	0.85	0.00	0.18	0.18	6.86	1.13	0.00
	1	0.56	4.21	0.30	2.45	0.01	0.72	0.74	5.56	3.24	0.01
	2	0.84	1.09	0.59	0.41	0.30	0.54	1.11	1.45	0.54	0.40
	3	-0.38	1.90	1.10	0.68	0.13	0.32	-0.50	2.51	0.90	0.17
	4	-0.27	1.59	-0.70	0.76	0.22	0.51	-0.35	2.10	1.01	0.30
	5	-0.07	0.27	-0.07	0.91	0.79	0.91	-0.09	0.35	1.20	1.04
Ireland	0	0.36	24.00	-4.67	0.68	0.00	0.00	0.48	31.68	0.90	0.00
	1	-1.32	7.17	0.71	0.21	0.00	0.46	-1.75	9.46	0.28	0.00
	2	0.50	1.72	-0.69	0.60	0.14	0.48	0.65	2.27	0.79	0.18
	3	0.39	1.25	0.27	0.68	0.27	0.76	0.52	1.65	0.89	0.35
	4	5.06	2.61	-0.30	0.03	0.11	0.74	6.67	3.44	0.04	0.14
	5	1.19	3.50	2.60	0.41	0.16	0.21	1.57	4.63	0.54	0.21
Spain	0	3.43	1.55	-2.07	0.01	0.15	0.07	4.52	2.05	0.01	0.19
	1	0.72	2.37	0.89	0.46	0.05	0.38	0.96	3.13	0.61	0.07
	2	0.42	1.51	1.45	0.65	0.18	0.19	0.55	2.00	0.86	0.23
	3	3.91	1.28	-1.42	0.02	0.26	0.22	5.17	1.68	0.03	0.34
	4	5.41	-2.02	1.44	0.03	0.16	0.26	7.14	-2.66	0.04	0.21
	5	-23.8	40.37	21.18	0.02	0.01	0.03	-6.44	10.89	0.01	0.00

Table 5.8.Results of VECM on the example of Ukraine

beta	*Coef.*	*Std. Err.*	*t*	*p>I t I*	*[95% Conf. Interval]*	
_ce1						
CO2GDP	1	.	.	.	.	.
Sal	-2.13	0.23	-7.66	0.000	-2.590	-1.688
SC	0.58	0.24	2.16	0.017	0.094	1.070
CSP	-1.67	0.13	-2.83	0.000	-1.935	-1.414

The cointegration VEC models will be as follows:

$$\begin{aligned}
\mathrm{ECT}_{\mathrm{POL}_t} &= -2.1694\,Sal_{t-1} + 0.5826\,SC_{t-1} - 1.6749\,CSP_{t-1} \\
\mathrm{ECT}_{GEM_t} &= -1.5698\,Sal_{t-1} + 0.9854\,C_{t-1} - 0.4587\,CSP_{t-1} \\
\mathrm{ECT}_{\mathrm{UKR}_t} &= -0.9325\,Sal_{t-1} + 0.5123\,SC_{t-1} - 1.2903\,CSP_{t-1} \qquad (5.1) \\
\mathrm{ECT}_{ROM_t} &= -2.6258\,Sal_{t-1} + 0.0234\,C_{t-1} - 0.2685\,CSP_{t-1} \\
\mathrm{ECT}_{ITL_{t_t}} &= -2.658\,Sal_{t-1} + 0.57945\,C_{t-1} - 0.6985\,CSP_{t-1}
\end{aligned}$$

The calculations show that tax revenues have the greatest impact on the overall indicators of economic and social development of the country in the context of shadowing the economy. The proposed approach is based on the basic

assumptions of the li/fe cycle of the organization, which are based on the assumption that the impact of tax gaps on the level of economic development of the country has a cumulative effect and increases over time. The dynamics of changing the manifestation of the tax gap in the economic horizon of managing the macroeconomic stability of the country is shown in the figure 5.7.

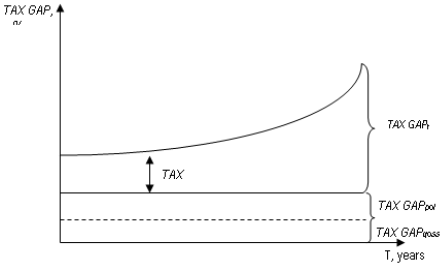


Figure 5.7. Dynamics of the tax gap on the economic horizon of management

The approach is based on a comparison of the actual volume of tax gaps with the volumes of the regulatory gap and the gross gap. As these values, we propose to use the minimum level of tax gap, which the world community estimates as such, the minimization of which is impossible 10%.

Investigating the function of the dependence of the tax gap on time as a continuous, the tax gap at time t can be defined as:

$$\text{Tax Gap}_t = \text{Tax Gap}_0 \times e^{\alpha T} \qquad (5.2)$$

where Tax Gap_t – the tax gap is calculated at time t, %; Tax Gap_0 – tax gap in the base period, %; t – the time at which the assessment of tax gaps; $\propto$ – a parameter that reflects the impact of tax gaps on the level of socio-ecological and economic development of the country; T – economic management horizon.

The α parameter is based on the consideration of risks and additional effects for the country from the existence of the phenomenon of shadowing of the economy and the formation of a tax gap. The parameter α is a continuous rate that balances the above socio-ecological and economic losses and the effects of the formation of tax gaps in the national economy.

The negative effect of the formation of tax gaps has a greater impact in the long run, which explains the assessment of its future size. The positive effect of the formation of the phenomenon of tax gaps is explained by the formation of value-added in the economy due to additional employment, sales in the official market of shadow goods and services and is more significant for the current time.

Hence, the value of the parameter α will be determined by the formula:

$$a = \ln (1 - i_t(1 - PV(E)p_t \quad (5.3)$$

where *PV (E)* – total economic benefits brought to the current moment, which is the result of the formation of the tax gap; p_i – the probability of economic losses due to the tax gap; i_t – the discount rate.

In the retrospective period of 2010–2019, the losses of Ukraine's economy due to the tax gap were estimated at an average of 46% GDP. Therefore, when determining the forecast scenarios, this value is taken as the basic feature for a realistic scenario, and pessimistic and optimistic - formed based on ± 14.5% of it (total confidence interval of 30%). Therefore, the probability of economic losses due to tax gaps is taken at the level of 0.6 - for pessimistic, 0.46 - for realistic, and 0.32 - for optimistic scenarios. The main parameter in assessing the socio-ecological and economic losses from the existence of the phenomenon of tax gaps is the probability of risk of tax evasion by economic entities.

We propose to rank losses depending on the value of the probability of shadowing of the economy based on Sturgess's formula. According to the results of the calculations, three groups of risks of the impact of tax gaps on the indicators of social and economic development of the country were identified:

– high (0,66 - 1] - the level of tax gaps, characterized by excessive impact on the socio-economic development of the country, is significant and irreversible in its consequences;

– medium (0,33 - 0,66] - the level of tax gaps, which is characterized by a high impact on the socio-economic development of the country, is smaller in size, and its consequences may be partially untouched in the long run

– low [0 - 0,33] - the level of tax gaps with little impact at which the effects on the socio-economic development of the country are destructive and can be compensated in the short term or due to effective public policy measures to neutralize their negative impact are absent.

Depending on the probability of losses, the number of tax gaps will have a different nature of the impact on the indicators of social and economic development of the country in the forecast period.

The practical approbation of the proposed approach to forecasting will be carried out with a duration of the time lag of 15 years. In the process of calculations, the analysis of the degree of influence of the volume of tax gaps with the value of the probability of losses of 0.32, 0.46 and 0.6 (Fig. 5.8-5.10).

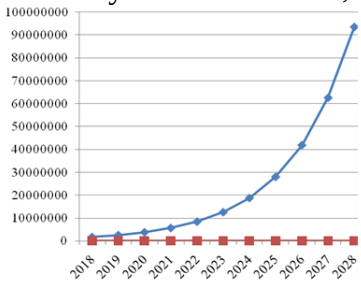


Figure 5.8. Graphical representation of the dynamics of tax gaps in the forecast period at p = 0.32

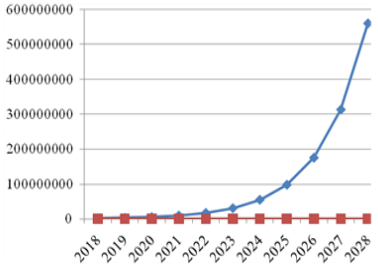


Figure 5.9. Graphical representation of the dynamics of tax gaps in the forecast period at p = 0,46

Thus, depending on the probability of loss of value, the amount of tax gaps will have different effects on the indicators of social, environmental and economic development of the country in the forecast period.

Given the low risk of shadow financial transactions (p=0.32) and, accordingly, insignificant amounts of tax evasion, slower growth rates of the cumulative negative effect on the country's economy and its rather small scale in the first years are typical.

With a realistic scenario of economic development and unchanged conditions for the implementation of the policy of de-shadowing of the economy (p=0.46), there is an increase in tax gaps compared to the optimistic scenario. At the same time, the growth rate is quite slow in the first years.

In the pessimistic scenario of economic development (the risk of shadow financial transactions is 0.6 or more) the volume of the tax gap will grow much faster in a relatively short period.

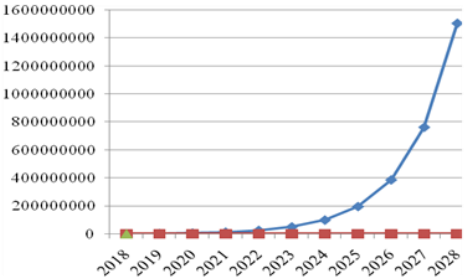


Figure 5.10. Graphical representation of the dynamics of tax gaps in the forecast period at p = 0,6

Thus, the analysis allows us to conclude that the shadowing of the economy has a significant impact on the indicators of economic and social development of the country. A significant share of the shadow economy leads to a deterioration in the material well-being of the population, the level of their social protection, significantly affects the indicator of economic development of the country and its ability to implement economic and social development programs.

The obtained dependences can serve as a basis for forecasting possible losses of the economy from the existence of tax gaps and will contribute to the development and implementation of state prevention in the direction of de-shadowing of the national economy.

5.2 Reducing Shadow Economy through effective transaction monitoring and anti-money laundering in the context of promoting inclusive growth

The world economic system is facing an essential restructuring of the financial system and, as a significant part thereof, the banking system. The banking system in all countries worldwide, regardless of their economic model and the organization of public relations, currently plays one of the most important roles in ensuring the movement of cash flows, since it takes part in fulfilling the basic functions of the financial system. In the context of globalization, innovation, the development of scientific and technological progress in the banking sector, risks and threats associated with the turnover of illegal funds arise and exacerbate. At the present stage, the process of economic development of Ukraine provides for the need to adequately identify new risks and find efficient tools for measuring, minimizing and preventing them. A sufficiently specific risk in the activity of banks is the risk of using banking services for money laundering or terrorism financing.

Over the past ten years, there has been a significant acceleration in the evolution of ever new methods of money laundering, which are becoming more diverse and specific, and the mechanisms for money laundering are becoming more complicated and diversified. In turn, the existing certain weakness of national systems, significant loopholes in the regulation of the financial system, imperfect financial monitoring system, the lack of a unified approach to risk assessment contribute to the successful implementation of criminal operations, hiding the true sources of the origin of illegal funds. Therefore, the issue of assessing the risks of money laundering requires in-depth study, analysis, and elaboration.

The heads of all banking institutions are striving to improve the functioning of their organization through the efficient and rational use of resources. One of the most effective ways to efficiently implement financial monitoring in banks in the area of assessing the risks of money laundering is the recognition by bank employees of the principles of the financial monitoring system, the introduction of a comprehensive assessment of the functioning of such a system on an ongoing basis. Thus, there is a need to analyze the efficiency of financial monitoring of banks in the context of assessing the risks of money laundering using the latest techniques.

Risk is a rather complex and multifaceted phenomenon, not only in the economy, but also in other areas of society. This is confirmed by the diverse stances on the essence of the concept of risk, as well as existing shortcomings in the legislation. Modern economic literature acknowledges the following aspects of formalization: risk as an economic category risk as a phenomenon or process, unpredictability and the possibility of events with negative consequences. Moreover, the scientists carried out the identification of existing risks, analysis and methods of their assessment, financial mechanisms of risk management, described the nature, classification and characteristics of economic risks, presented methods of risk assessment and methods of choosing optimal solutions from existing alternatives, presented a system of categories of risk factors and their assessment in the processes of financial monitoring of banks of Ukraine; raise the issue of identification, control and minimization of risk categories that adversely affect the financial monitoring system in banks of Ukraine; identified sources of terrorism financing, possible ways of transferring funds by terrorist groups and areas for the subsequent use of such funds to finance terrorism; analyzed the features of assessing the

risk of laundering of illegal income of primary financial monitoring entities.

Another scientists pay significant attention to the following issues: mechanisms for money laundering through the use of illegal cash flow schemes, the practical side of contact with offshore territories; exchange of world experience in countering the destructive consequences of work with offshore territories; the latest trends in the application of specialized knowledge and skills in the investigation of crimes; regulation of the functioning of law enforcement agencies to investigate money laundering.

Some authors, in their papers emphasize the need to: solve the problem of terrorism in its various aspects; analysis of the characteristic features of international terrorist activity; identification of current shortcomings of state policy regarding counter-terrorism; assessment of terrorist crimes and their devastating consequences; the need to strengthen criminal liability for financing and committing terrorist acts.

Among the legal achievements, did the following: examined the features of regulation and counteraction to money laundering; identified emerging issues of countering investment in the proliferation of weapons of mass destruction; provided certain suggestions for improving the regulatory framework; analyzed the features of identification of money laundering crimes, established the reasons for the insufficient efficiency of modern methods for combating money laundering and terrorism financing, made specific recommendations on countering money laundering.

The study of the concepts of financial monitoring, money laundering and efficiency in relation to the available literature was also carried out by constructing a bibliometric map of the categories “financial monitoring”, “money laundering”, “efficiency” over the past five years, namely from 2016 to 2020 in the following areas: in economics, finance, management,

econometrics, accounting, business, by applying the software VOSViewerv.1.6.10. The results of the study of the available literature are shown as a graph (Figure 5.11). Creating a bibliometric map of the periods under investigation is based on the data of papers found and sorted in the Scopus database.

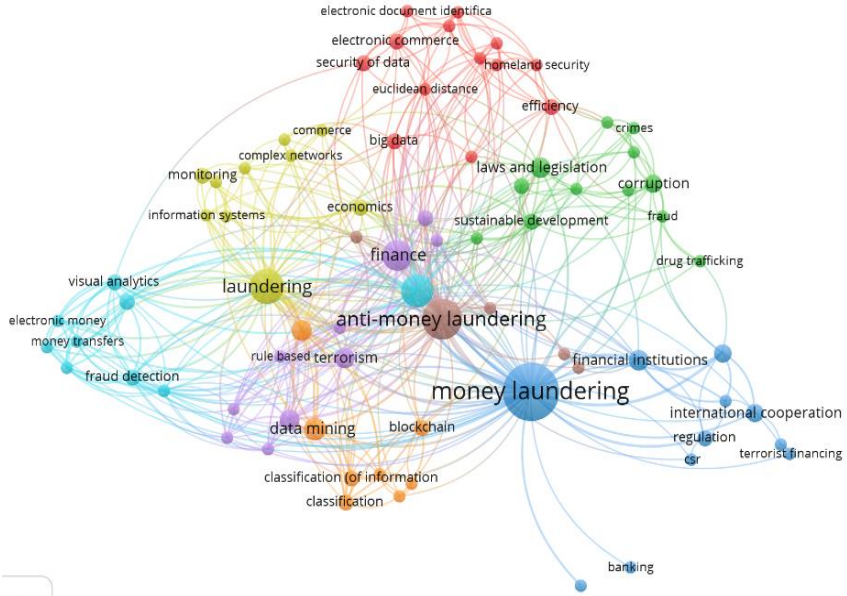


Figure 5.11. Bibliometric map of the categories "financial monitoring", "money laundering", "efficiency" for the period of the last five years, namely from 2016 to 2020, by applying the software VOSViewerv.1.6.10.

The subsequent analysis of Figure 1 allows concluding that the study of the efficiency of financial monitoring of banks in terms of assessing the risks of money laundering is especially relevant today, and a significant number of papers by scholars confirm this. Thus, 8 clusters were identified that contain specific keywords that differ in color. Among them, special

attention should be paid to clusters directly related to categories, such as anti-money laundering, combating terrorism financing, detecting fraud, economic and financial security, sustainable development, corruption, etc.

To calculate the efficiency of banking institutions in Ukraine, it is proposed to use the software Banxia Frontier Analyst 4. According to an analysis of the interpretations describing the practical aspects of the above software, it is indicated that Frontier Analyst is a tool for analyzing the efficiency, which uses a technology called Data Envelopment Analysis (DEA). This tool is used to study and establish the relative efficiency of certain units with similar properties. As part of the analysis, the identification of inputs and outputs takes place, and the variables are divided into controlled and uncontrolled characteristics. The corresponding ratio of outputs and inputs is calculated for all the variables presented, and the result of the evaluation of the efficiency of all units of the specified analysis is established at the end. A comparative process follows, which is peer-to-peer, and the future potential of improvements proposed for inefficient units of analysis is predicted in the form of realistic and achievable numbers.

Frontier Analyst software is used to perform benchmarking; develop a visualization of important information that will be used in further research; to carry out the more efficient distribution of available resources; find the information needed to develop an efficient planning strategy; identify the worst and best elements; to conduct a deeper study of variables and units.

Certain issues that arise in this area are not yet sufficiently and incompletely disclosed in existing publications, and therefore require further study, research, and improvement. Thus, based on the peculiarities of evaluating the efficiency of banking institutions of Ukraine in terms of the national system for assessing the risks of money laundering, terrorism financing

and the proliferation of weapons of mass destruction, there is a need to identify and develop efficient tools for economic and mathematical modeling that can help to group banking institutions, as well as provide a reasonable assessment of the type of risk presented, identify certain problem areas of analysis.

For the further development of the issues under consideration, a scientific and methodological approach to assessing the technical efficiency of financial monitoring of Ukrainian banks using the DEA analysis in the Frontier software of the functioning environment by building:

1) input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs (the share of financial transactions registered based on the internal financial monitoring; a violation of the Resolution of the NBU Board; a violation of the Anti-Money Laundering Law of Ukraine; a violation of the Law on Banks; share of cash inflows from total revenues, the share of cash expenditures of the total expenditures);

2) output-oriented CCR model of the linear fractional programming problem of maximizing conditional outputs (risk assessment of money laundering) with constant returns to scale. Conditional inputs are calculated based on the additive convolution of variables of the efficiency of banks of Ukraine weighted by the method of the first principal component. Clustering of banks is based on the application of the k-means clustering. Unlike the existing ones, the proposed approach allows forming groups of efficiently and inefficiently operating banks, determining the available reserve and potential for increasing efficiency both for the group as a whole and for each individual bank, providing a graphical interpretation of the current position of banks relative to competitors in the environment of functioning in the banking market in the context of various areas of strategic management.

Implementation of the scientific and methodological approach to assessing the technical efficiency of financial monitoring of Ukrainian banks using the DEA-analysis is proposed as the following sequence of stages.

Stage 1. Clustering of Ukrainian banks based on the k-means clustering. The clustering technique is proposed, i.e. the iterative divisive clustering with k- means in the part of the set of multidimensional research methods. Practical implementation is carried out using the software Statistica 8. As part of the application of the k-means method in terms of the initial cluster centers, it is proposed to use the approach of considering the distance and choosing observations at constant intervals. The k-means method is based on certain quantitative characteristics: average variables for each cluster (i.e. it involves averaging within an individual cluster), Euclidean distances (the so-called Euclidean metrics), and squares of Euclidean distances between specific clusters.

The following describes the practical implementation of the clustering of certain studied objects using the proposed method and software. Thus, to evaluate and compare different clusters, it is proposed to use the results of the analysis of variance, which are presented in Figures 5.12-5.15 in terms of allocating sequentially from 2 to 14 clusters.

	Analysis of Variance (Spreadsheet1.sta)					
Variable	Between SS	df	Within SS	df	F	signif. p
K1	0,00	1	1,49	63	0,1522	0,697762
K2	3325,41	1	10102,04	63	20,7385	0,000025
K3	34166,78	1	5711,44	63	376,8765	0,000000
K4	3376,52	1	9466,03	63	22,4720	0,000013
K5	0,00	1	3,38	63	0,0191	0,890547
K6	0,08	1	2,91	63	1,6591	0,202439

2 groups

	Analysis of Variance (Spreadsheet1.sta)					
Variable	Between SS	df	Within SS	df	F	signif. p
K1	0,01	2	1,485	62	0,1945	0,823709
K2	3983,70	2	9443,749	62	13,0769	0,000018
K3	35556,80	2	4321,418	62	255,0692	0,000000
K4	10064,80	2	2777,749	62	112,3244	0,000000
K5	0,01	2	3,370	62	0,0899	0,914145
K6	0,08	2	2,907	62	0,8827	0,418815

3 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,02	3	1,475	61	0,2719	0,845417
K2	10128,08	3	3299,369	61	62,4173	0,000000
K3	36181,66	3	3696,559	61	199,0212	0,000000
K4	10600,52	3	2242,035	61	96,1376	0,000000
K5	0,04	3	3,338	61	0,2542	0,858048
K6	0,37	3	2,616	61	2,9023	0,041972

4 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,03	4	1,468	60	0,2703	0,895985
K2	11137,62	4	2289,826	60	72,9594	0,000000
K3	36908,04	4	2970,180	60	186,3929	0,000000
K4	11009,52	4	1833,031	60	90,0927	0,000000
K5	0,05	4	3,333	60	0,2114	0,931154
K6	0,38	4	2,605	60	2,2157	0,077929

5 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,02	5	1,474	59	0,1632	0,975036
K2	10393,36	5	3034,085	59	40,4213	0,000000
K3	38666,29	5	1211,926	59	376,4769	0,000000
K4	12254,93	5	587,620	59	246,0913	0,000000
K5	0,06	5	3,321	59	0,2075	0,958080
K6	0,48	5	2,511	59	2,2511	0,060910

6 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,03	6	1,460	58	0,2289	0,965655
K2	11971,13	6	1456,312	58	79,4616	0,000000
K3	37162,34	6	2715,872	58	132,2728	0,000000
K4	12097,90	6	744,653	58	157,0480	0,000000
K5	0,25	6	3,133	58	0,7628	0,602067
K6	0,50	6	2,492	58	1,9319	0,090813

7 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,17	10	1,327	54	0,6794	0,738540
K2	12093,99	10	1333,460	54	48,9760	0,000000
K3	39457,59	10	420,630	54	506,5526	0,000000
K4	12345,16	10	497,390	54	134,0275	0,000000
K5	0,90	10	2,477	54	1,9685	0,055410
K6	0,61	10	2,376	54	1,3964	0,207037

11 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,19	11	1,304	53	0,7044	0,728662
K2	12406,89	11	1020,556	53	58,5746	0,000000
K3	39409,62	11	468,598	53	405,2143	0,000000
K4	12392,62	11	449,933	53	132,7085	0,000000
K5	0,69	11	2,687	53	1,2423	0,283569
K6	0,63	11	2,361	53	1,2834	0,259636

12 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,30	12	1,196	52	1,0815	0,394525
K2	12406,97	12	1020,473	52	52,6850	0,000000
K3	39409,62	12	468,594	52	364,4411	0,000000
K4	12453,37	12	389,183	52	138,6614	0,000000
K5	0,91	12	2,472	52	1,5907	0,123484
K6	0,69	12	2,296	52	1,3091	0,241957

13 groups

Variable	Analysis of Variance (Spreadsheet1.sta)					
	Between SS	df	Within SS	df	F	signif. p
K1	0,32	13	1,176	51	1,0611	0,412220
K2	12406,67	13	1020,772	51	47,6819	0,000000
K3	39446,11	13	432,110	51	358,1267	0,000000
K4	12485,52	13	357,029	51	137,1923	0,000000
K5	0,92	13	2,464	51	1,4574	0,166673
K6	0,69	13	2,301	51	1,1738	0,324756

14 groups

Figure 5.12. Analysis of the adequacy of clustering of Ukrainian banks into 2-7 and 11-14 groups as of 2019

	Analysis of Variance (Spreadsheet1.sta)					
Variable	Between SS	df	Within SS	df	F	signif. p
K1	0,15	7	1,343	57	0,9154	0,501452
K2	12270,79	7	1156,657	57	86,3863	0,000000
K3	37164,78	7	2713,438	57	111,5292	0,000000
K4	12093,98	7	748,569	57	131,5571	0,000000
K5	0,57	7	2,812	57	1,6458	0,141265
K6	0,60	7	2,391	57	2,0398	0,065501

Figure 5.13. Analysis of the adequacy of clustering of Ukrainian banks into 8 groups as of 2019

This figure shows the values of intergroup (Between SS) and intragroup (Within SS) variances of these features.

The quality of this type of clustering is characterized by relevant criteria, namely:

– maximization of the value of intergroup variance, as well as minimization of the value of intragroup variance. Compliance with this condition shows the quality assigning each defined variable of banking institutions to a particular cluster and, accordingly, the quality of clustering;
– the value of the Fisher criterion (F) and the probability of a possible deviation of the null hypothesis (p), namely, the inappropriateness of using a certain variable to describe the degree to which banking institutions are assigned to a particular cluster. As a result of qualitative clustering, the value of F is maximized, and the value of p approaches the zero mark.

Therefore, the analysis of the results of assigning banking institutions of Ukraine in groups of 8 clusters in 2019 means that the clustering has been completed, since the value of p in terms of such characteristics as the share of financial transactions recorded based on the internal financial monitoring; the share of

cash inflows from the total amount of inflows; the share of cash outlays from the total amount of outlays is more than 0.05 that is acceptable for economic research. At the same time, for such characteristics, the value of the Fisher criterion is not statistically significant, the intergroup dispersion index varies from 0.15 to 0.60, and the intragroup dispersion index is more than a thousand. Thus, the process of grouping banking institutions of Ukraine into 8 clusters is inadequate, and this entails the need to analyze the 9-cluster grouping of certain research objects (Figure 5.14).

	Analysis of Variance (Spreadsheet1.sta)					
Variable	Between SS	df	Within SS	df	F	signif. p
K1	0,28	8	1,211	56	1,6370	0,135080
K2	12229,96	8	1197,484	56	71,4913	0,000000
K3	37203,38	8	2674,840	56	97,3604	0,000000
K4	12207,68	8	634,874	56	134,5995	0,000000
K5	0,45	8	2,935	56	1,0623	0,402364
K6	0,53	8	2,461	56	1,5037	0,176795

Figure 5.14. Analysis of the adequacy of clustering of Ukrainian banks into 9 groups as of 2019

The study of the grouping of banking institutions of Ukraine into 9 clusters in 2019 means that the quality of grouping is improving in terms of the share of financial transactions registered based on the internal financial monitoring, as well as improved quality of such clustering.

The following grouping of banking institutions from 9 to 10 contributes to the reduction of the quality of clustering, as the value of p for the analyzed characteristics is the share of financial transactions registered based on the internal financial monitoring; the share of cash inflows from the total amount of inflows; the share of cash expenditures of the total amount of

expenditures becomes greater than 0.05, which is not acceptable for economic research.

	Analysis of Variance (Spreadsheet1.sta)					
Variable	Between SS	df	Within SS	df	F	signif. p
K1	0,28	9	1,210	55	1,4367	0,195472
K2	12359,96	9	1067,483	55	70,7581	0,000000
K3	38800,88	9	1077,340	55	220,0943	0,000000
K4	12417,76	9	424,791	55	178,6439	0,000000
K5	0,46	9	2,916	55	0,9733	0,472015
K6	0,53	9	2,458	55	1,3217	0,247265

Figure 5.15. Analysis of the adequacy of clustering of Ukrainian banks into 10 groups as of 2019

Further formation of 10 clusters leads to a deterioration in the values of both intergroup dispersion and intragroup dispersion, Fisher criterion. This fact means that the following clustering into more than 9 groups is not feasible.

Turning to the comparative analysis of selected clusters of banks in Ukraine, we consider the ratio of average values of input variables (Figure 5.16).

Analyzing the selected 9 clusters using the Statistica software, it should be noted that only 1 bank forms some of the clusters. This situation is typical for clusters 1, 7, and 9. In our opinion, such a situation is not feasible, given the uniformity of descriptive characteristics (Euclidean distances between components) of these groups. To level out the indicated problems, a further rearrangement of 9 clusters into 6 clusters is proposed, which are shown in Figures 5.17 – 5.21.

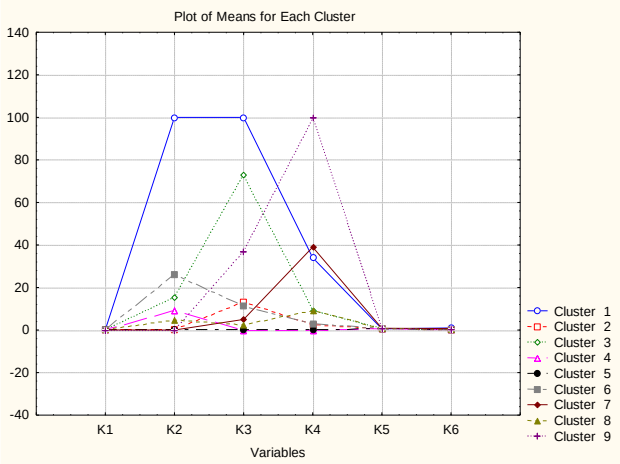


Figure 5.16.Visualization of the ratio of the average values of the input variables in terms of selected clusters

Considering the first cluster (Figure 5.17), we establish the composition of the banking institutions of Ukraine that form it. Thus, according to the k-means clustering, 5 banking institutions are referred to the 1st cluster:

	Members of Cluster Number 2 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 5 cases
Case No.	Distance
C_8	6,536338
C_13	1,260224
C_16	2,312586
C_20	2,188678
C_50	2,308975

	Descriptive Statistics for Cluster 1 (Spreadsheet1.sta) Cluster contains 1 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,2013	0,00	0,00
K2	100,0000	0,00	0,00
K3	100,0000	0,00	0,00
K4	34,0000	0,00	0,00
K5	0,5588	0,00	0,00
K6	1,0000	0,00	0,00

Figure 5.17. Composition of the first out of six conditional clusters of banks of Ukraine in the context of money laundering and descriptive statistics of the first cluster

Next, proceeding to the analysis of descriptive statistics of the first cluster (Figure 5.16) in terms of the average value, the value of the standard deviation and the dispersion indicator for each of the 6 defined variables, we summarize that in the context of this group of banking institutions of Ukraine, the violation of the Resolution of the NBU Board are decisive, as well as the violation of the Anti-Money Laundering Law of Ukraine, the violation of the Law of Ukraine on Banks, in which the average values are respectively 100 units, 100 units, 34 units, accordingly. The minimum values of mean-square deviations are found in the context of all 6 variables, and this implies that the minimum variation is established in terms of such characteristics between the 5 banking institutions of this cluster, i.e. the similarity of the size of the values. The maximum scatter of Euclidean distance values is observed in the context of the 8th bank in comparison with other banks.

Turning to the second of the six conditional clusters of banks in Ukraine in terms of money laundering, we note that this group has the following composition: 1, 4, 9, 14, 22, and 31 banking institutions (Figure 5.18). Based on Figure 5.18, it is possible to draw a conclusion about the determining features of this group

in terms of such variables as the violation of the Anti-Money Laundering Law; the violation of the Law on Banks.

	Members of Cluster Number 3 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 6 cases
Case No.	Distance
C_1	11,01400
C_4	10,69935
C_9	12,82663
C_14	7,54443
C_22	9,13011
C_31	5,91773

	Descriptive Statistics for Cluster 2 (Spreadsheet1.sta) Cluster contains 5 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,06525	0,065357	0,00427
K2	0,40000	0,547723	0,30000
K3	13,00000	9,000000	81,00000
K4	2,60000	2,880972	8,30000
K5	0,86964	0,082559	0,00682
K6	0,40808	0,247655	0,06133

Figure 5.18. Composition of the second out of the six conditional clusters of banks in Ukraine in terms of money laundering and descriptive statistics of the second cluster

The third of the six conditional clusters of Ukrainian banks in terms of money laundering is proposed to be formed of 6 components: 5,17, 65, 2, 18, and 10 (Figure 5.19). In the context of the average values of the variables selected for analysis, we note that the determining areas for the formation of this group are the violation of the Resolution of the NBU Board; the violation of the Anti-Money Laundering Law of Ukraine; the violation of the Law on Banks.

	Members of Cluster Number 4 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 3 cases
Case No.	Distance
C_5	0,960305
C_17	1,930919
C_65	0,993965

	Members of Cluster Number 1 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 1 cases
Case No.	Distance
C_2	0,00

	Members of Cluster Number 7 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 1 cases
Case No.	Distance
C_18	0,00

	Members of Cluster Number 9 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 1 cases
Case No.	Distance
C_10	0,00

	Descriptive Statistics for Cluster 3 (Spreadsheet1.sta) Cluster contains 6 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,09113	0,02651	0,0007
K2	15,33333	14,52813	211,0667
K3	73,00000	19,18333	368,0000
K4	9,00000	10,56409	111,6000
K5	0,75185	0,14606	0,0213
K6	0,41765	0,18838	0,0355

Figure 5.19. Composition of the third out of the six conditional clusters of banks in Ukraine in terms of money laundering and descriptive statistics of the third cluster

The fourth group, which contains 43 components, is the most numerous in terms of the number of participating banks (the fragment is presented in Figure 5.20). The defining feature of this cluster is the homogeneity of the values of all 6 variables characterizing money laundering, in terms of averages, in variance, and root-mean-square deviations.

	Members of Cluster Number 5 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 43 cases
Case No.	Distance
C_6	0,160823
C_7	0,356369
C_11	0,166931
C_12	0,219776
C_15	0,235676
C_19	0,291699
C_21	0,190505
C_23	0,744726
C_24	0,177889
C_25	0,371162
C_26	1,142137
C_27	0,203237
C_28	0,197443

	Descriptive Statistics for Cluster 4 (Spreadsheet1.sta) Cluster contains 3 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,379208	0,542008	0,29377
K2	9,333333	4,041452	16,33333
K3	0,000000	0,000000	0,00000
K4	0,000000	0,000000	0,00000
K5	0,535088	0,473707	0,22440
K6	0,293911	0,253570	0,06430

Figure 5.20. Composition of the fourth out of the six conditional clusters of banks in Ukraine in terms of money laundering and descriptive statistics of the fourth cluster

The fifth and sixth groups of banks are small and at the same time specific (Figures 5.21, 5.22). Thus, for the fifth group, the defining areas are violations of the Resolution of the NBU Board and violations of the Anti-Money Laundering Law of Ukraine. For the sixth group, violations of the Resolution of the NBU Board; violations of the Anti-Money Laundering Law of Ukraine; violations of the Law on Banks.

	Members of Cluster Number 6 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 3 cases
Case No.	Distance
C_3	7,336069
C_39	5,173688
C_44	3,364827

	Descriptive Statistics for Cluster 5 (Spreadsheet1.sta) Cluster contains 43 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,107526	0,107728	0,011605
K2	0,209302	0,599926	0,359911
K3	0,232558	0,648706	0,420820
K4	0,232558	0,781854	0,611296
K5	0,737773	0,211235	0,044620
K6	0,390369	0,200499	0,040200

Figure 5.21. Composition of the fifth out of the six conditional clusters of banks in Ukraine in terms of money laundering and descriptive statistics of the fifth cluster

	Members of Cluster Number 8 (Spreadsheet1.sta) and Distances from Respective Cluster Center Cluster contains 2 cases
Case No.	Distance
C_36	2,115538
C_54	2,115538

	Descriptive Statistics for Cluster 6 (Spreadsheet1.sta) Cluster contains 3 cases		
Variable	Mean	Standard Deviation	Variance
K1	0,05923	0,04736	0,0022
K2	26,33333	5,13160	26,3333
K3	11,33333	15,50269	240,3333
K4	3,00000	3,00000	9,0000
K5	0,61717	0,14776	0,0218
K6	0,33949	0,17410	0,0303

Figure 5.22. Composition of the sixth out of the six conditional clusters of banks in Ukraine in terms of money laundering and descriptive statistics of the sixth cluster

Stage 2. Entering basic data. At this stage, the initial data on assessing the performance of banks in the Banxia Frontier Analyst 4 software are imported using the basic user interface, the variables are preliminarily analyzed and grouped into conditionally input (controlled discretionary and uncontrolled exogenously fixed or non-discretionary) and output variables, the relevant variables are identified and the appropriateness of their inclusion in the model, the choice of data interpretation method are defined.

To implement this stage, one source variable was selected: RLKD – quantitative assessment of the risk of money laundering. The following list of variables is proposed to be selected as input controlled discretionary variables: K1 – the share of financial transactions registered based on the internal financial monitoring; K2 – the violation of the Resolution of the NBU Board; K3 – the violation of the Anti-Money Laundering Law of Ukraine; K4 – the violation of the Law on Banks; K5 – the share of cash inflows from the total amount of inflows; K6 – the share of cash expenditures of the total amount of expenditures.

Table 5.9. Input and output variables of the efficiency of Ukrainian banks in terms of combating money laundering as of 2019

	Group 1						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 8	0.1739	0	29	3	0.7715	0.4377	0.5276
Bank 13	0.0011	1	10	3	0.8906	0.3415	0.6019
Bank 16	0.0508	0	8	0	0.9269	0.8141	0.0254
Bank 20	0.0342	1	10	7	0.7968	0.2832	0.6489
Bank 50	0.0664	0	8	0	0.9624	0.1640	0.7000
	Group 2						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 1	0.0760	20	48	0	0.6305	0.1815	0.4428
Bank 4	0.1107	38	86	7	0.5571	0.2163	0.4880

Bank 9	0.0514	6	97	27	0.9017	0.4259	0.5373
Bank 14	0.1181	1	83	3	0.8640	0.6472	0.6074
Bank 22	0.0785	24	54	1	0.8725	0.5823	0.6607
Bank 31	0.1121	3	70	16	0.6852	0.4528	0.6819
	Group 3						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 5	0.1376	7	0	0	0.7043	0.2532	0.4945
Bank 17	1.0000	14	0	0	0.9009	0.5654	0.6428
Bank 65	0.0000	7	0	0	0.0000	0.0632	0.7266
Bank 2	0.2013	100	100	34	0.5588	1.0000	0.4603
Bank 18	0.0703	0	5	39	0.8460	0.7008	0.6465
Bank 10	0.0260	0	37	100	0.8243	0.4176	0.5457
	Group 4						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 6	0.1239	0	0	0	0.7919	0.3932	0.4974
Bank 7	0.0525	1	0	0	0.8879	0.4456	0.5185
Bank 11	0.1169	0	0	0	0.6306	0.4507	0.5743
Bank 12	0.0061	0	0	0	0.4874	0.1357	0.5876
Bank 15	0.1960	0	0	0	0.3609	0.2130	0.6156
Bank 19	0.0000	0	0	0	0.1801	0.5801	0.6469
Bank 21	0.0000	0	0	0	0.7154	0.1586	0.6507
Bank 23	0.0173	0	2	0	0.6043	0.1075	0.6610
Bank 24	0.2434	0	0	0	0.8602	0.4569	0.6707
Bank 25	0.0916	1	0	0	0.8338	0.6797	0.6733
Bank 26	0.1195	0	0	3	0.7082	0.6535	0.6741
Bank 27	0.1841	0	0	0	0.7403	0.0904	0.6767
	Group 5						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 3	0.0798	25	29	6	0.7306	0.2668	0.4873
Bank 39	0.0051	32	0	3	0.4501	0.2135	0.6909
Bank 41	0.3088	0	0	0	0.9087	0.6575	0.6929
	Group 6						
Bank	K1	K2	K3	K4	K5	K6	RLKD
Bank 36	0.4713	0	5	9	0.9318	0.5672	0.6900
Bank 54	0.0000	9	0	9	0.0000	0.0000	0.7051

Turning to the identification of relevant variables, we checked the feasibility of their inclusion in the model using the method of principal components in the software Statistica 6.0. Thus, according to the results of factor loads and the scree plot, it was identified that among the list of basic variables for assessing the technical efficiency of Ukrainian banks using the DEA analysis of the functioning environment, it is necessary to include all of the above variables for consideration.

The results of the implementation of this stage of the scientific and methodological approach to evaluating the efficiency of Ukrainian banks on the example of the first group of banks as of 2019 are presented in Figure 5.23.

Unit Name	Activ	K1	K2	K3	K4	K5	K6	RLKD
Bank 8	☑	0,17	0,00	29,00	3,00	0,77	0,44	0,53
Bank 13	☑	0,00	1,00	10,00	3,00	0,89	0,34	0,60
Bank 16	☑	0,05	0,00	8,00	0,00	0,93	0,81	0,03
Bank 20	☑	0,03	1,00	10,00	7,00	0,80	0,28	0,65
Bank 50	☑	0,07	0,00	8,00	0,00	0,96	0,16	0,70

Figure 5.23. Introduction of basic data for evaluating the efficiency of Ukrainian banks in terms of combating money laundering as of 2019

Stage 3. Structuring the project of the DEA analysis of the operating environment by building an input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs and the output-oriented CCR model of the linear fractional programming problem of maximizing the ratio of conditional outputs with constant returns to scale (Figure 5.24).

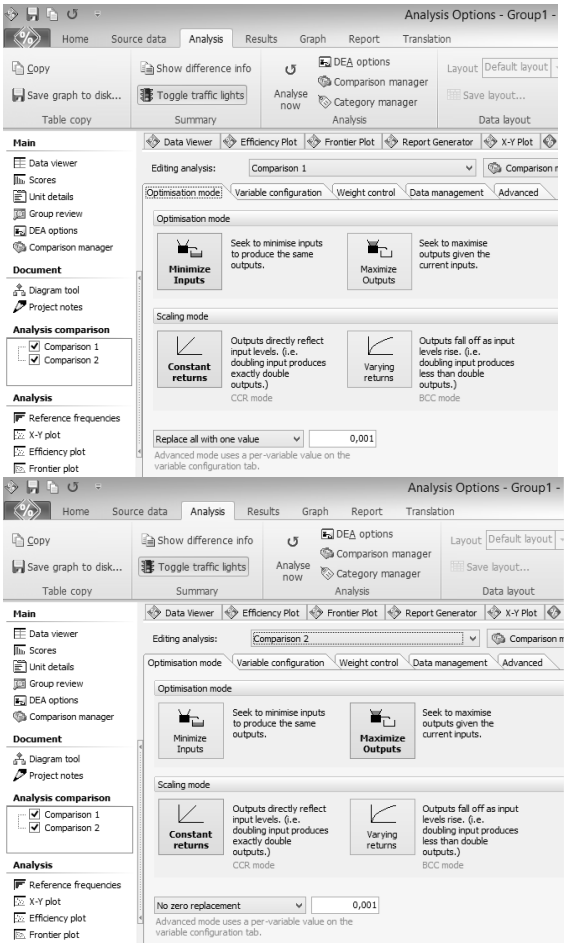


Figure 5.24 – Window for selecting parameters and output conditions for constructing an input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs and the output-oriented CCR model of the linear fractional programming problem of maximizing the ratio of conditional outputs with constant returns to scale

Turning to the mathematical formalization of this stage, there is a need, first, to determine the priority of input and output variables, which is proposed to be based on the use of the principal component method using the software Statistica (Figure 5.25).

	Variable contributions, based on correlations (Group1.sta
Variable	Factor 1	Factor 2	Factor 3	Factor 4
Var1	0,298143	0,080795	0,033033	0,047681
Var2	0,022014	0,364335	0,022552	0,289749
Var3	0,360635	0,005985	0,002365	0,400983
Var4	0,045597	0,342923	0,020015	0,239949
Var5	0,273604	0,101922	0,051025	0,021453
Var6	0,000006	0,104039	0,871010	0,000184

	Variable contributions, based on correlations (Group2.sta
Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Var1	0,025662	0,145184	0,609888	0,001612	0,027324
Var2	0,233504	0,028441	0,013952	0,566782	0,146140
Var3	0,109294	0,182608	0,255254	0,206774	0,207993
Var4	0,150368	0,332927	0,012568	0,047813	0,424392
Var5	0,281582	0,047058	0,104181	0,101229	0,020848
Var6	0,199589	0,263782	0,004157	0,075790	0,173302

	Variable contributions, based on correlations (Group3.sta
Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Var1	0,000715	0,455570	0,122864	0,394816	0,025311
Var2	0,272722	0,025261	0,159528	0,000884	0,088198
Var3	0,326977	0,059660	0,001539	0,069957	0,092586
Var4	0,058858	0,015530	0,544029	0,240115	0,052088
Var5	0,031063	0,394160	0,171608	0,095757	0,306703
Var6	0,309665	0,049818	0,000432	0,198470	0,435114

Variable	Variable contributions, based on correlations (Group4.sta					
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Fact
Var1	0,080151	0,141599	0,463320	0,002660	0,239058	0,07
Var2	0,179717	0,409825	0,019699	0,007954	0,013379	0,36
Var3	0,171807	0,073508	0,010337	0,462954	0,280954	0,00
Var4	0,080900	0,253189	0,149238	0,297451	0,078140	0,14
Var5	0,177859	0,113360	0,171305	0,221432	0,146961	0,16
Var6	0,309565	0,008518	0,186101	0,007550	0,241508	0,24

Variable	Variable contributions, based on correlations (Group5.sta	
	Factor 1	Factor 2
Var1	0,213214	0,023333
Var2	0,215348	0,016764
Var3	0,045588	0,539502
Var4	0,155390	0,201391
Var5	0,150420	0,216695
Var6	0,220040	0,002315

Variable	Variable contributions, based on correlations (Group6.sta
	Factor 1
Var1	0,166667
Var2	0,166667
Var3	0,166667
Var4	0,166667
Var5	0,166667
Var6	0,166667

Figure 5.25. Results of assessing the priority of variables characterizing the efficiency of combating money laundering

Analysis of Figure 5.25 allows drawing conclusions. Taking into account the first principal component (Factor1) in terms of all six selected clusters, for the first group of banks the most important variables are the share of financial transactions registered based on the internal financial monitoring (0.29); the violation of the Anti-Money Laundering Law (0.36); the share of cash inflows from the total amount of inflows (0.27), as each of them is approximately 30% of the total weight; variables such as the violation of the Resolution of the NBU Board (0.02) and the share of cash inflows from the total amount of inflows (0.04) are less important, and the variable of the share of cash expenditures from the total amount of expenditures, which share is 0, is not important.

For the second group of banks, the most important variables are the violation of the Resolution of the NBU Board (0.23); the share of cash inflows from the total amount of inflows (0.28); the share of cash expenditures of the total amount of expenditures (0.20), as each of them occupies at least 20% of the

total weight; variables such as the violation of the Anti-Money Laundering Law of Ukraine (0.10); the violation of the Law on Banks (0.15) are less important, and the least important is the share of financial transactions registered based on the internal financial monitoring, the share of which is 0.02.

For the third group of banks, the most important variables are the violation of the Resolution of the NBU Board (0.27); the violation of the Anti-Money Laundering Law of Ukraine (0.32); the share of cash expenditures in the total amount of expenditures (0.30), as each of them occupies approximately 30% of the total weight; variables such as the violation of the Law on Banks (0.05), the share of cash inflows from the total amount of inflows (0.03) are less important, and the share of financial transactions registered based on the internal financial monitoring (0.0007) is almost not important.

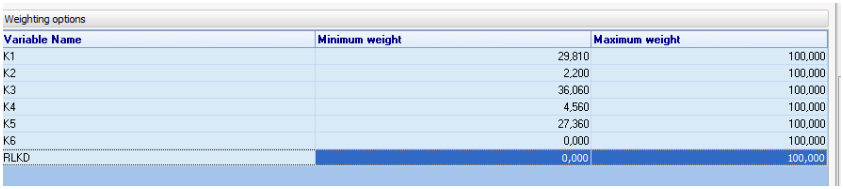
For the fourth group of banks, the most important variable is the share of cash expenditures in the total amount of expenditures (0.30), as its share is 30% of the total weight; variables such as the violation of the Resolution of the NBU Board; the violation of the Anti-Money Laundering Law of Ukraine; the share of cash inflows from the total amount of inflows is moderately important, as their share is 0.17 each, and the least important are the variables of the share of financial transactions registered based on the internal financial monitoring; the violation of the Law on Banks, the share of which is 0.08.

For the fifth group of banks, the most important variables are the share of financial transactions registered based on the internal financial monitoring (0.21); the violation of the Resolution of the NBU Board (0.21); the share of cash expenditures in the total amount of expenditures (0.22), as each of them occupies at least 20% of the total weight; variables such as the violation of the Law on Banks; the share of cash inflows

from the total amount of inflows is less important and amounts to 0.15 each, and the least important is the rate of the violation of the Anti-Money Laundering Law, the share of which is 0.04 of the total weight.

For the sixth group of banks, all variables are equally important, and the weight of each is 0.16 of the total weight of all variables.

Carrying out the selection of certain parameters and initial conditions for creating BCC model of conditional inputs minimization and CCR model of conditional ratios maximization of financial monitoring efficiency of Ukrainian banks, we determine the minimum and maximum values of priority of variables selected based on the application of the Fishburne formula (on the example of the first group of Ukrainian banks as of 2019) (Figure 5.26).



Weighting options

Variable Name	Minimum weight	Maximum weight
K1	29,810	100,000
K2	2,200	100,000
K3	36,060	100,000
K4	4,560	100,000
K5	27,360	100,000
K6	0,000	100,000
RLKD	0,000	100,000

Figure 5.26. Establishing the priority of variables for assessing the efficiency of Ukrainian banks of the first group as of 2019

The next step of the second stage of the proposed scientific and methodological approach to assessing the efficiency of financial monitoring of banking institutions of Ukraine involves direct mathematical formalization of the process of building an input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs and of the linear fractional programming problem of maximizing the ratio of conditional outputs with constant returns to scale:

$$\max \theta = \frac{\sum_i u_i w_i y_i}{\sum_i v_i w_i x_i}$$

$$\begin{cases} \dfrac{\sum_i u_i w_i y_i}{\sum_i v_i w_i x_i} \le 1, \\ \min w_i \le w_i \le 100\% \\ x_i \ge 0, y_i \ge 0 \end{cases} \qquad (5.4)$$

where θ - the level of technical efficiency of financial monitoring of the selected banking institution;

u_i - characteristics of the econometric model of the dependence of the technical efficiency of the financial monitoring of the selected banking institution on the category of conditional outputs;

y_i - i-th characteristic of conditional outputs;

v_i - characteristics of the econometric model of the dependence of the technical efficiency of the financial monitoring of the selected banking institution on the category of conditional inputs;

x_i - i-th characteristic of conditional inputs;

Stage 3. Analysis of the obtained results of the application of an input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs and output-oriented CCR model of the linear fractional programming problem of maximizing conditional outputs with constant returns to scale for the efficiency of financial monitoring of Ukrainian banks. A comprehensive analysis of the

results of the study is shown on the example of 34 banks from the six groups of banking institutions in Ukraine as of 2019.

Turning to the analysis of certain results for the first group of banks in Ukraine (Figure 5.27), it should be noted that the work of Bank 13 and Bank 50 for the BCC model for minimizing conditional inputs and Bank 16 for the CCR model for maximizing conditional outputs proved efficient in 2019 as evidenced by the calculated indicator of technical efficiency of the financial monitoring system at the level of 100%. Moreover, three banks of the first group – Bank 16 (4.0 %%), Bank 20 (74.4%), Bank 8 (43.5%) for the BCC model, and four banks – Bank 13 (60.2%)), Bank 20 (4.1%), Bank 50 (3.3%) and Bank 8 92.6%) for the CCR model, showed inefficient performance.

First group

Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Bank 13	100,0%	✔		60,2%		
Bank 16	4,0%			100,0%	✔	
Bank 20	77,4%			4,1%		
Bank 50	100,0%	✔		3,3%		
Bank 8	43,5%			2,6%		

Second group

Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Banj 14	100,0%	✔		100,0%	✔	
Bank 1	100,0%	✔		100,0%	✔	
Bank 22	86,9%			39,0%		
Bank 31	100,0%	✔		80,4%		
Bank 4	75,8%			62,4%		
Bank 9	60,4%			88,3%		

Third group

Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Bank 10	75,4%			100,0%	✔	
Bank 17	49,3%			52,7%		
Bank 18	100,0%	✔		100,0%	✔	
Bank 2	2,4%			6,1%		
Bank 5	50,1%			100,0%	✔	
Bank 65	100,0%	✔		100,0%	✔	

Fourth group

Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Banj 24	70,1%			55,0%		
Bank 11	65,2%			68,3%		
Bank 12	95,4%			100,0%	✔	
Bank 15	91,3%			83,3%		
Bank 19	100,0%	✔		100,0%	✔	
Bank 21	100,0%	✔		100,0%	✔	
Bank 23	94,3%			73,2%		
Bank 25	49,4%			37,0%		
Bank 26	62,8%			47,3%		
Bank 6	54,9%			77,1%		
Bank 7	40,1%			51,5%		
Bank27	100,0%	✔		88,3%		

Fifth group

Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Bank 3	44,8%			90,1%		
Bank 39	100,0%	✓		100,0%	✓	
Bank 41	100,0%	✓		100,0%	✓	

Sixth group

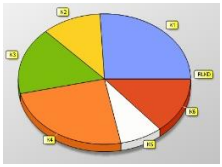
Units	Comparison 1			Comparison 2		
Unit name	Score	Efficient	Condition	Score	Efficient	Condition
Bank 36	100,0%	✓		100,0%	✓	
Bank 54	100,0%	✓		100,0%	✓	

Figure 5.27. Efficiency of the 1-6 group of Ukrainian banks as of 2019 for the BCC model and for the CCR model

Having identified efficiently functioning objects of research in terms of Ukrainian banks of the first group according to the input-oriented BCC model of minimizing conditional inputs, we establish the available reserve and potential for increasing the efficiency of financial monitoring for the group as a whole (Figure 5.28).

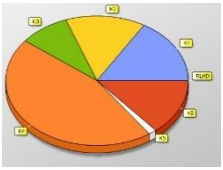
First group

K1 -25,87%
K2 -11,13%
K3 -16,5%
K4 -24,6%
K5 -8,04%
K6 -13,87%
RLKD 0%



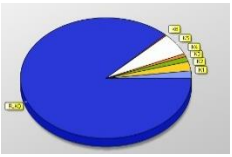
Second group

K1 16,46 %
K2 -14,05%
K3 -8,8%
K4 -45,46 %
K5 -1,36%
K6 -13,87%
RLKD 0%



Third group

K1 -1,99%
K2 2,46%
K3 -1,44%
K4 -0,84%
K5 -5,89%
K6 0,11%
RLKD 87,28%



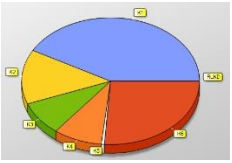
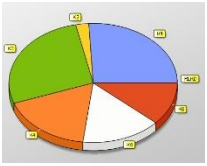
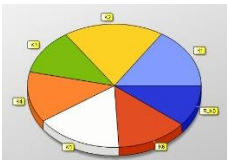
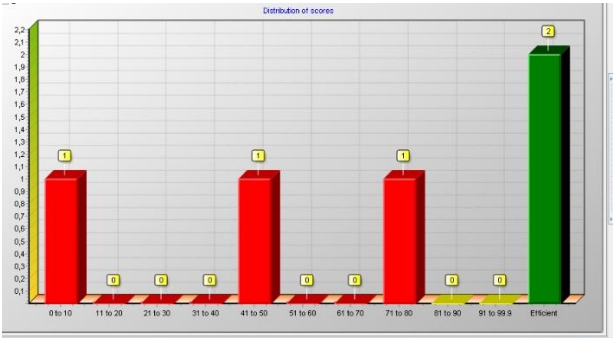
Fourth group	K1 -41,84% K2 -13,92% K3 -8,7% K4 -8,82%	K5 0,65% K6 -26,07% RLKD 0%	
Fifth group	K1 -25,81% K2 -2,63% K3 -27,02% K4 -17,49%	K5 -15,28% K6 -11,77% RLKD 0%	
Sixth group	K1 15,96 % K2 18,36% K3 12,03% K4 13,36%	K5 16,14% K6 13,25% RLKD 10,9%	

Figure 5.28. Potential for improving the efficiency of financial monitoring of the 1-6 groups of Ukrainian banks as of 2019 for the BCC model

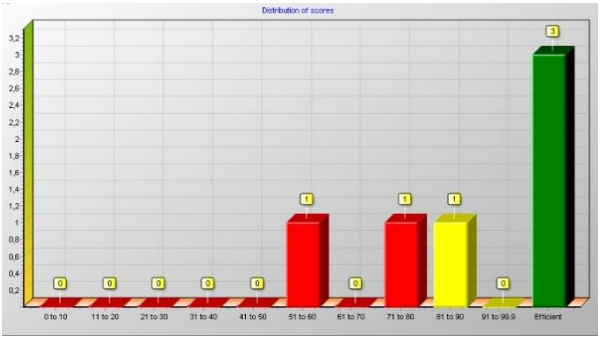
Therefore, it is concluded that in this case, it is not worth spending effort on variables: K1 – the share of financial transactions registered based on the internal financial monitoring, K2 – the violation of the Resolution of the NBU Board; K3 - the violation of the Anti-Money Laundering Law, K4 – the violation of the Law on Banks, K5 – the share of cash inflows from the total amount of inflows, K6 – the share of cash expenditures from the total amount of expenditures, RLKD – quantitative assessment of the risk of money laundering.

The distribution graph (Figure 5.29) clearly shows the data on the range of performance evaluations and details of the number of banks with their scores in each range. Thus, 1 bank is in the range of 0-10, 1 in 41-50, 1 in 71-80, 1 bank in the efficient range, i.e. 100% efficient.

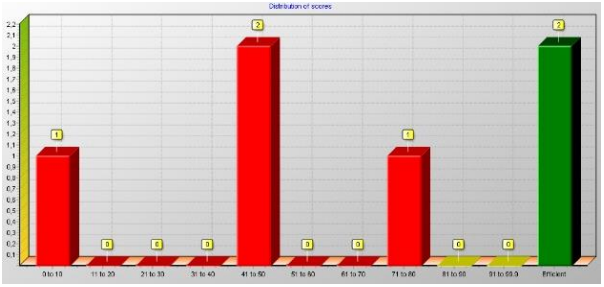
First group



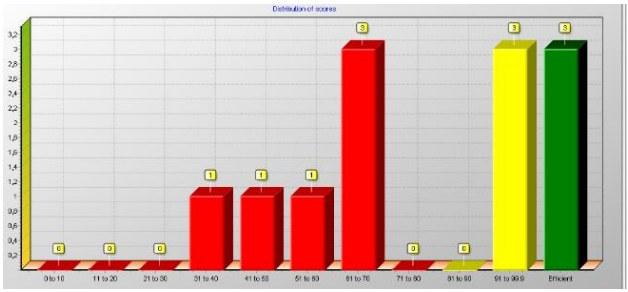
Second group



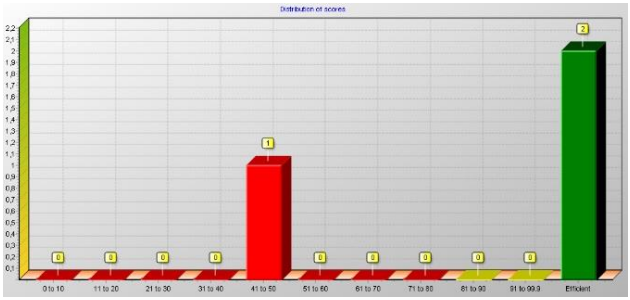
Third group



Fourth group



Fifth group



Sixth group

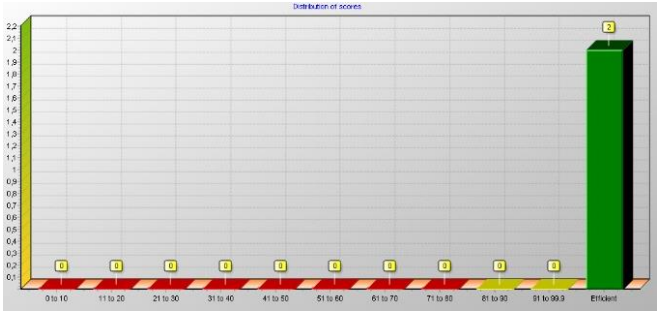
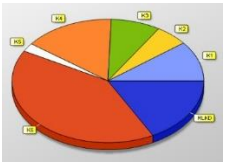
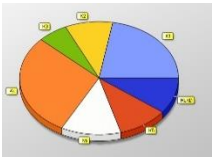
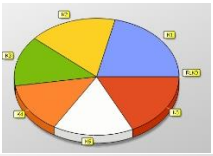
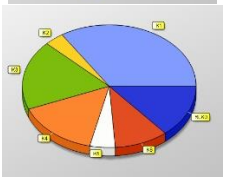


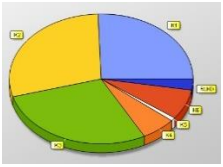
Figure 5.29. Distribution graph of estimates of the efficiency of financial monitoring of the 1-6 groups of banks of Ukraine as of 2019 for the BCC model

Having identified efficient research objects in terms of Ukrainian banks of the first group according to the output-oriented CCR model of the linear fractional programming problem of maximizing conditional outputs, the existing reserve

and potential for increasing the efficiency of financial monitoring for the group was determined (Figure 5.30). Thus, it is concluded that there is a reserve for all input variables. Thus, the largest amounts of reserves are set for such variables as K6 – the share of cash expenditures of the total expenditures of 40.68%. Average efforts should be made to improve the variable K1 – the share of financial transactions registered based on the internal financial monitoring of 10.52%. At the same time, the smallest reserve of this group of banks is observed according to the variable K5 – the share of cash inflows from the total inflows of 2.43%. It is not necessary to spend efforts on variables: K2, K3, K4, RLKD.

First group	K1 10,52% K2 – 5,52% K3 -8,29% K4 -15,27%	K5 2,43% K6 40,60% RLKD -17,29%	
Second group	K1 22,19% K2 -9,78% K3 5,99% K4 -29,25%	K5 12,1% K6 10,29% RLKD -10,4%	
Third group	K1 -21,48 % K2 -17,07% K3 -13,96% K4 -13,96%	K5 -15,86% K6 -17,65% RLKD 0%	
Fourth group	K1 -34,22 % K2 3,56% K3 18,22% K4 15,47%	K5 4,54% K6 -1,0% RLKD -13,96%	

Fifth group	K1 -25,61 % K2 28,83% K3 -28,45% K4 -6,08%	K5 -0,88% K6 7,35% RLKD-2,8 %



Sixth group	K1 -10,67 % K2 -12,27% K3 -16,09% K4 -17,88%	K5 -10,79% K6 -17,73% RLKD14,57 %

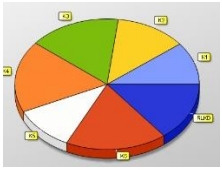
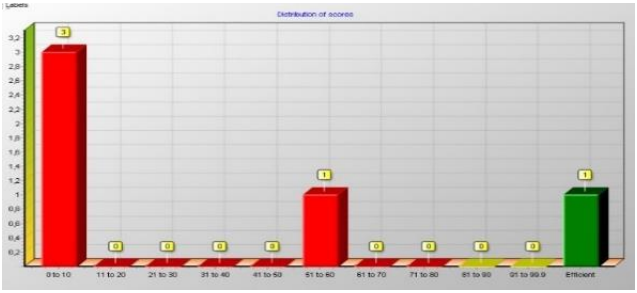


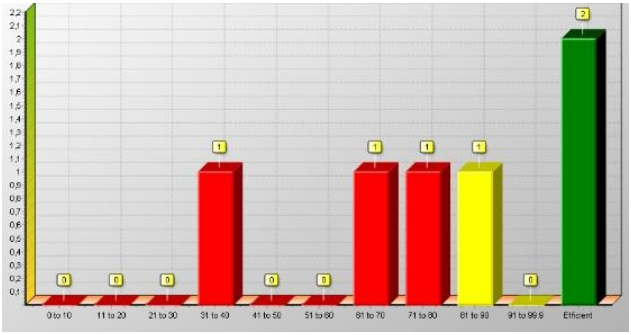
Figure 5.30. Potential for improving the efficiency of financial monitoring of the 1-6 groups of Ukrainian banks as of 2019 for the CCR model

Accordingly, the distribution graph (Figure 5.31) depicts the data relative to the range of performance evaluations, i.e. 3 banks are in the range of 0-10, 1 in 51-60, 1 bank in the efficient range and is 100% efficient.

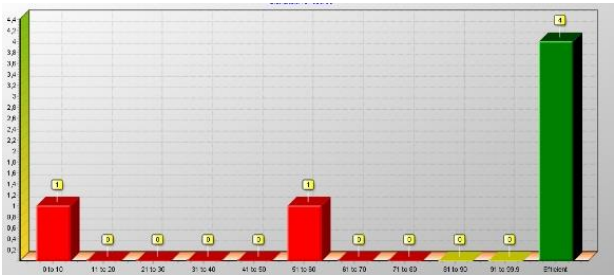
First group



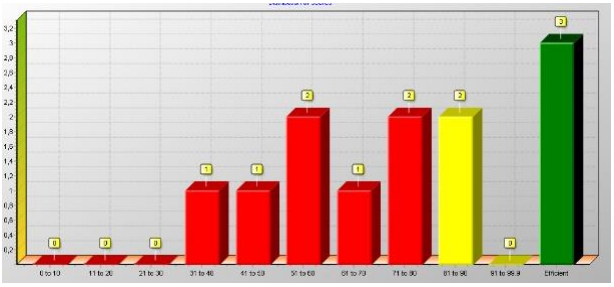
Second group



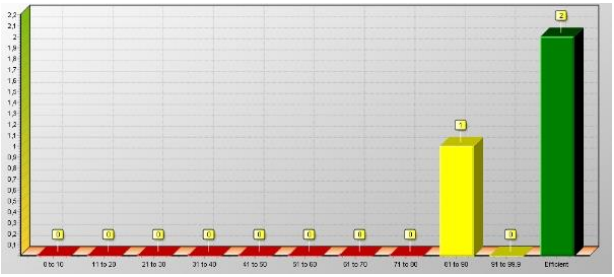
Third group



Fourth group



Fifth group



Sixth group

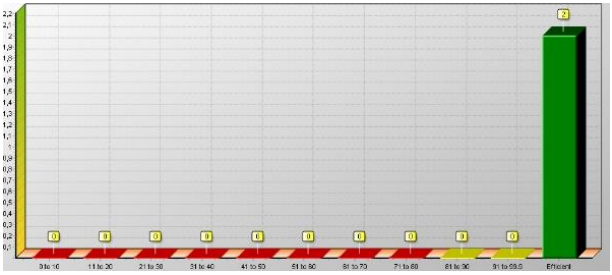


Figure 5.31. Distribution graph of assessments of the efficiency of the financial monitoring of the 1-6 groups of banks of Ukraine as of 2019 for the CCR model

Similar to the study of the first group of banks, it was found that the second group of banks in Ukraine (Annex B, Figure B.1) are 100% efficient in 2019 for the BCC model – Bank 14, Bank 1, Bank 31, and for the CCR model – Bank 14 and Bank 1. The banks of the second group – Bank 22 (86.9%), Bank 4 (75.8%), Bank 9 (60.4%) for the BCC model, and banks – Bank 22 (39.0%), Bank 31 (80.4%), Bank 4 (62.4%) and Bank 9 (88.3%) for the CCR model showed inefficient performance.

Similar to the analysis of the first group of banks, the second group of banks is graphically shown as a pie chart (table 5.31) of possible improvement of financial monitoring in the form of relative percentages of potential improvement for each of the input/output variables in the defined range.

For the BCC model, the average effort should be directed to improving the variable K1 (16.46%). There is no need to spend effort on variables K2, K3, K4, K5, K6, RLKD. For the CCR model, efforts should be directed to improving the variable K1 (22.19%), K5 (12.1%), K6 (10.29%). Minor efforts can be made to improve the K3 variable (5.99%). It is not necessary to spend efforts on variables K2, K4, RLKD. The banks of the third, fourth, fifth and sixth groups are similarly analyzed and graphically depicted (table 5.31).

Similar to the analysis of the first group of banks, the distribution graph (Appendix B, Figure B.3, Figure B.5) of the banks of the second group shows that for the BCC model 1 bank is in the range of 51-60, 1 in 71-80, 1 in 51-60, 1 in 71-80, 1 in 81-90 and 3 banks in the efficient range; for the CCR model, 1 bank is in the range of 31-40, 1 in 61-70, 1 in 71-80, 1 in 81-90 and 2 banks in the efficient range. Similarly, the distribution graphs show and allow analyzing the banks from the third, fourth, fifth and sixth groups (table 5.31).

We will focus on the analysis of inefficient banking institutions with the help of information data contained in the tab of details of banking institutions on potential improvements in their performance, reference comparison, reference materials, as well as input or output data on individual banks.

The graph of potential improvements (Figure 5.32) shows the percentage changes for each variable that the bank must do to achieve the efficiency of financial monitoring. The graph shows that the improvement of variables is possible for Bank 8, i.e. K2 by 86.08%, K5 by 123.57%, K6 by 246.10% for CCR model, but the improvement of variables is not required for the BCC model. There is also the possibility of reduction for some variables, namely: for CCR model – K1 by 45.68%, K3 by 48.67%, K4 by 99.99%, RLKD by 97.42%, and for the BCC model by all variables, except RLKD, i.e. K1 by 71.23%, K2 by 24.63%, K3 by 73.21%, K4 by 100.0%, K5 by 5.98%, and K6 by 71.76%

Figure 5.32. Analysis of the efficiency and potential for improving the financial monitoring of Bank 8 as of 2019 for the CCR model and for the BCC model

Potential changes can also be considered in tabular form (Figure 5.33). The fact column shows the values achieved at the moment. In the target column, the values that must be achieved for the efficient operation of the financial monitoring of the bank. The potential improvements column shows the difference between the fact and the plan in percentage terms.

Unit selection

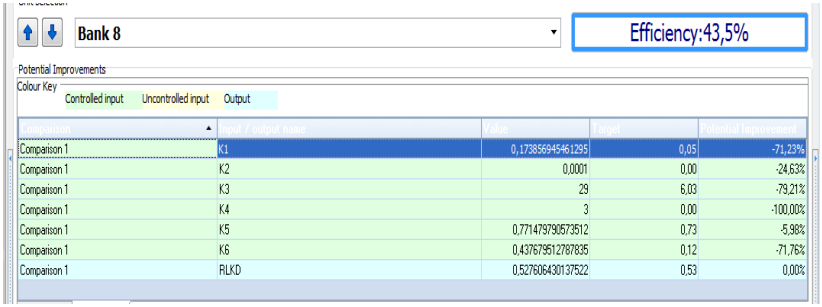
Bank 8

Efficiency:2,6%

Potential Improvements

Colour Key: Controlled input | Uncontrolled input | Output

Comparison	Input / output name	Value	Target	Potential Improvement
Comparison 2	K1	0,173856945461295	0,09	-45,68%
Comparison 2	K2	0,0001	0,00	86,08%
Comparison 2	K3	29	14,89	-48,67%
Comparison 2	K4	3	0,00	-99,99%
Comparison 2	K5	0,771479790573512	1,72	123,57%
Comparison 2	K6	0,437679512787835	1,51	246,10%
Comparison 2	RLKD	0,527606430137522	0,01	-97,42%



Comparison	Input / output name	Value	Target	Potential Improvement
Comparison 1	K1	0,173856945461295	0,05	-71,23%
Comparison 1	K2	0,0001	0,00	-24,63%
Comparison 1	K3	29	6,03	-79,21%
Comparison 1	K4	3	0,00	-100,00%
Comparison 1	K5	0,771479790573512	0,73	-5,98%
Comparison 1	K6	0,437679512787835	0,12	-71,76%
Comparison 1	RLKD	0,527606430137522	0,53	0,00%

Figure 5.33. Potential for improving the financial monitoring of Bank 8 as of 2019 for the CCR model and for the BCC model

The above summaries in graphical and tabular form can be provided for all inefficient banks that interest us in the study, similar to the analysis of Bank 8. Thus, for Bank 13, the graph of potential improvements (Appendix B, Figure B.1 and B.2) shows the possibility of improvement in terms of changes as follows for the BCC model: K1 by 221.87%. It is possible to reduce the following variables for the BCC model: K2 by 100.00%, K3 by 94.39%, K4 by 100.0%, K5 by 92.71%, K6 by 83.3%, RLKD by 39, 84%.

Similarly, the graphs of potential improvements in graphical and tabular form show and allow analyzing each inefficient bank in the first group (Appendix B, Figure B.3-B.8), as well as analyzing all inefficient banks in all six groups.

Stage 4. Systematization of the obtained results and creation of practical recommendations for improving certain areas of strategic management of banking institutions in terms of financial monitoring. At this stage, groups of efficient and inefficient banking institutions are first formed. Therefore, based on a thorough analysis of Table 5.10, the conclusion is made for:

– input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs

with constant returns to the scale about the stable efficient operation of such 14 banking institutions as Bank 13, Bank 50, Bank 14, Bank 1, Bank 31, Bank 18, Bank 65, Bank 19, Bank 21, Bank 27, Bank 39, Bank 41, Bank 36, Bank 54; 3 banks: Bank12, Bank 15, Bank23 are problematic; 17 banks were identified as the most problematic banks in terms of assessing the technical efficiency of financial monitoring: Bank 16, Bank 20, Bank 8, Bank 22, Bank 4, Bank 9, Bank 10, Bank 17, Bank 2, Bank 5, Bank 24, Bank 11, Bank 25, Bank 26, Bank 6, Bank 7, Bank 27.

– output-oriented CCR model of the linear fractional programming problem of maximizing conditional outputs with constant returns to scale about the stable efficient operation of such 14 banking institutions as Bank 16, Bank 14, Bank 1, Bank 10, Bank 18, Bank 5, Bank 65, Bank 12, Bank 19, Bank 21, Bank 39, Bank 41, Bank 36, Bank 54; 1 bank: Bank 3 is problematic; 19 banks were identified as the most problematic banks in terms of assessing the technical efficiency of financial monitoring: Bank 13, Bank 20, Bank 50, Bank 8, Bank 22, Bank 31, Bank 4, Bank 9, Bank 17, Bank 2, Bank 2, Bank 24, Bank 11, Bank15, Bank 23, Bank 25, Bank 26, Bank 6, Bank 7, Bank 27.

Table 5.10 Efficiency of financial monitoring of Ukrainian banks in 2019

Bank	BCC model	CCR model
Group 1		
Bank 8	43.5%	2.6%
Bank 13	100.0%	60.2%
Bank 16	4.0%	100.0%
Bank 20	77.4%	4.1%
Bank 50	100.0%	3.3%
Group 2		

Bank 1	100.0%	100.0%
Bank 4	75.8%	62.4%
Bank 9	60.4%	88.3%
Bank 14	100.0%	100.0%
Bank 22	86.9%	39.0%
Bank 31	100.0%	80.4%
Group 3		
Bank 5	50.1%	100.0%
Bank 17	49.3%	52.7%
Bank 65	100.0%	100.0%
Bank 2	2.4%	6.1%
Bank 18	100.0%	100.0%
Bank 10	75.4%	100.0%
Group 4		
Bank 6	54.9%	77.1%
Bank 7	40.1%	51.5%
Bank 11	65.2%	68.3%
Bank 12	95.4%	100.0%
Bank 15	91.3%	100.0%
Bank 19	100.0%	100.0%
Bank 21	100.0%	100.0%
Bank 23	94.3%	73.2%
Bank 24	70.1%	55.0%
Bank 25	49.4%	37.0%
Bank 26	62.8%	47.3%
Bank 27	100.0%	88.3%
Group 5		
Bank 3	44.8%	90.1%
Bank 39	100.0%	100.0%
Bank 41	100.0%	100.0%
Group 6		
Bank 36	100.0%	100.0%
Bank 54	100.0%	100.0%

The performance of financial monitoring on both models in 10 banks is efficient: Bank 14 (PJSC "KREDOBANK"), Bank 1 (PRIVATBANK), Bank 18 (JSC "PIRAEUS BANK ICB"),

Bank 65 (UKRAINIAN BANK OF RECONSTRUCTION AND DEVELOPMENT), Bank 19 (JSC "RUSSIAN STANDARD BANK"), Bank 21 (CJSC "CREDIT EUROPE BANK"), Bank 39 (JSB "CLEARING HOUSE"), Bank 41 (JSCB ARCADE), Bank 36 BANK ALLIANCE), Bank 54 ("PRIVATINVEST").

The second part of this stage determines the available reserve and the potential for increasing the efficiency of financial monitoring for the group as a whole and for each individual bank. Thus, the data in Table 5.11 present a clear interpretation of the feasibility of intensifying certain areas of strategic management of banking institutions in terms of financial monitoring.

Table 5.11. Potential for increasing the efficiency of financial monitoring for groups of Ukrainian banks in 2019

	1st group of banks		2nd group of banks		3rd group of banks	
Variable	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-25.87%	10.52%	16.46%	22.19%	-1.99%	-21.48%
K2	-11.13%	-5.52%	-14.05%-	-9.78%	2.46%	-17.07%
K3	-16.5%	-8.29%	-8.8%	5.99%	-1.44%	-13.96%
K4	-24.6%	15.27%	-45.46%	-29.25%	-0.84%	-13.96%
K5	-8.04%	2.43%	-1.36%	12.1%	-5.89%	-15.86%
K6	-13.87%	40.68%	-13.87%	10.29%	0.11%	-17.65%
RLKD	0%	-17.29%	0%	-10.4%	87.28%	0%
	4th group of banks		5th group of banks		6th group of banks	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-41.84%	-34.22%	-25.81%	-25.61%	15.96%	-10.67%
K2	-13.92%	3.56%	-2.63%	28.83%	18.36%	-12.27%
K3	-8.7%	18.22%	-27.02%	-28.45%	12.03%	-16.09%
K4	-8.82%	15.47%	-17.49%	-6.08%	13.36%	-17.88%
K5	0.65%	4.54%	-15.28%	-0.88%	16.14%	-10.79%
K6	-26.07%	-10%	-11.77%	7.35%	13.25%	-17.73%
RLKD	0%	-13.98%	0%	-2.8%	10.9%	-14.57%

Table 5.12. Growth potential of the efficiency of financial monitoring for first group of banks by banks of Ukraine in 2019

Variable	1st group of banks									
	Bank8		Bank13		Bank16		Bank20		Bank50	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-71.2%	-45.7%	0.0%	221.8%	-95.3%	0.0%	-96.5%	41.4%	0.0%	-16.9%
K2	-24.6%	86.1%	0.0%	-100.0%	-96.4%	0.0%	7.8%	-99.9%	0.0%	8.7%
K3	-79.2%	-48.7%	0.0%	-94.4%	-96.4%	0.0%	7.8%	-23.8%	0.0%	8.7%
K4	-100.0%	-99.9%	0.0%	-100.0%	-96.4%	0.0%	-53.8%	-100.0%	0.0%	8.7%
K5	-5.9%	123.6%	0.0%	-92.7%	-96.2%	0.0%	20.5%	10.8%	0.0%	4.7%
K6	-71.8%	246.1%	0.0%	-83.3%	-99.3%	0.0%	30.0%	173.9%	0.0%	439.5%
RL KD	0.0%	-97.4%	0.0%	-39.8%	0.0%	0.0%	0.0%	-95.9%	0.0%	-96.7%

Table 5.13. Growth potential of the efficiency of financial monitoring for second group of banks by banks of Ukraine in 2019

	2nd group of banks									
	Bank1,14		Bank4		Bank9		Bank22		Bank31	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	0.0%	0.0%	-24.4%	-0.2%	71.7%	194.1%	44.3%	66.%	0.0%	16.7%
K2	0.0%	0.0%	-42.0%	-23.5%	-60.6%	-78.7%	44.3%	43.13%	0.0%	-63.1%
K3	0.0%	0.0%	-38.5%	-18.8%	-43.1%	9.5%	44.3%	52.7%	0.0%	31.3%
K4	0.0%	0.0%	-100.0%	-100.0%	-53.3%	-85.8%	44.3%	-99.9%	0.0%	-79.2%
K5	0.0%	0.0%	24.7%	64.6%	-40.1%	22.6%	44.3%	24.1%	0.0%	39.6%
K6	0.0%	0.0%	-7.6%	22.0%	-16.2%	94.5%	44.3%	-46.5%	0.0%	58.3%
RL KD	0.0%	0.0%	0.0%	-37.6%	0.0%	-11.7%	44.3%	-60.9%	0.0%	-19.6%

Table 5.14. Growth potential of the efficiency of financial monitoring for third group of banks by banks of Ukraine in 2019

3rd group of banks										
	Bank5		Bank17		Bank 65, 18		Bank2		Bank10	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-99.9%	0.0%	-99.9%	-89.4%	0.0%	0.0%	-98.7%	-99.9%	202.4%	0.0%
K2	35.9%	0.0%	-10.2%	-61.5%	0.0%	0.0%	81.0%	-88.9%	11.9%	0.0%
K3	35.9%	0.0%	79.6%	-23.1%	0.0%	0.0%	-100.0%	-100.0%	-84.9%	0.0%
K4	35.9%	0.0%	79.6%	-23.1%	0.0%	0.0%	-99.9%	-100.0%	-56.4%	0.0%
K5	-99.9%	0.0%	-99.9%	-39.9%	0.0%	0.0%	-99.5%	-99.9%	14.9%	0.0%
K6	-66.1%	0.0%	-79.9%	-65.6%	0.0%	0.0%	63.4%	-90.0%	87.8%	0.0%
RL KD	99.7%	0.0%	103.0%	0.%	0.0%	0.0%	3,9%	0.0%	32.6%	0.0%

Table 5.15. Growth potential of the efficiency of financial monitoring for fourth group of banks by banks of Ukraine in 2019

4th group of banks										
	Bank 6		Bank 7		Bank 11		Bank 12		Bank 15	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-99.9%	-92.5%	-89.8%	-74.6%	-94.9%	-92.2%	-98.51%	0.0%	-14.0%	-96.46%
K2	-23.6%	53.2%	-99.9%	-99.9%	-2.3%	49.8%	-9.7%	0.0%	-9.0%	14.63%
K3	-23.6%	53.2%	-11.8%	120.3%	-2.3%	49.8%	-9.7%	0.0%	-9.0%	14.63%
K4	-23.6%	53.2%	-11.8%	120.3%	-2.3%	49.8%	-9.7%	0.0%	-9.0%	14.63%
K5	-30.9%	-5.7%	-51.6%	20.9%	-24.5%	15.8%	32.6%	0.0%	86.6%	54.80%
K6	-69.17%	-47.1%	-73.1%	-32.9%	-70.6%	-54.9%	5.6%	0.0%	-61.41%	-27.00%
RL KD	0.00%	-22.9%	0.0%	-48.6%	0.0%	-31.77%	0.0%	0.0%	0.00%	-16.73%

	Bank 25		Bank 23		Bank 24		Bank 19,21		Bank 26	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-99.8%	-84.4%	-99.4%	-57.5%	-25.1	-96.0%	0.0%	0.0%	-99.9%	-90.6%
K2	-99.9%	-99.9%	1.6%	21.5%	-0.9%	59.4%	0.0%	0.0%	3.6%	84.3%
K3	3.4%	135.8%	-99.9%	-99.9%	-0.9%	59.4%	0.0%	0.0%	3.6%	84.3%
K4	3.4%	135.8%	1.6%	21.5%	-0.9%	59.4%	0.0%	0.0%	-100.0%	-99.9%
K5	-11.2%	37.8%	20.3%	-1.9%	-14.7%	-9.6%	0.0%	0.0%	4.6%	26.9%
K6	-75.8%	-52.9%	49.8%	53.3%	-80.4%	-52.6%	0.0%	0.0%	-74.8%	-61.7%
RLKD	0.0%	-63.0%	0.0%	-26.9%	0.0%	-45.0%	0.0%	0.0%	0.0%	-52.7%

Table 5.16. Growth potential of the efficiency of financial monitoring for fifth group of banks by banks of Ukraine in 2019

Variable	5th group of banks					
	Bank3		Bank39		Bank41	
	BCC model	CCR model	BCC model	CCR model	BCC model	CCR model
K1	-95.52%	-90.01%	0.00%	0.00%	0.00%	0.00%
K2	-9.72%	101.31%	0.00%	0.00%	0.00%	0.00%
K3	-100.0%	-100.0%	0.00%	0.00%	0.00%	0.00%
K4	-64.73%	-21.36%	0.00%	0.00%	0.00%	0.00%
K5	-56.55%	-3.11%	0.00%	0.00%	0.00%	0.00%
K6	-43.57%	25.82%	0.00%	0.00%	0.00%	0.00%
RLKD	0.00%	-9.86%	0.00%	0.00%	0.00%	0.00%

Table 5.17. Growth potential of the efficiency of financial monitoring for fifth group of banks by banks of Ukraine in 2019

Variable	6th group of banks			
	Bank36		Bank54	
	BCC model	CCR model	BCC model	CCR model
K1	0.00%	0.00%	0.00%	0.00%
K2	0.00%	0.00%	0.00%	0.00%
K3	0.00%	0.00%	0.00%	0.00%
K4	0.00%	0.00%	0.00%	0.00%
K5	0.00%	0.00%	0.00%	0.00%
K6	0.00%	0.00%	0.00%	0.00%
RLKD	0.00%	0.00%	0.00%	0.00%

Thus, analyzing the study, we note that in this work, a mathematical economic, structural logical model of the efficiency of financial monitoring of Ukrainian banks in terms of the national system for assessing the risks of money laundering, terrorism financing and the proliferation of weapons of mass destruction was carried out based on Data Envelopment Analysis using the Frontier Analyst environment. Based on the DEA-analysis of the environment, an input-oriented BCC model of the linear fractional programming problem of minimizing conditional inputs and an output-oriented CCR model of the linear fractional programming problem of maximizing conditional outputs with constant returns to scale were built.

Moreover, conditional inputs were calculated based on the additive convolution of the variables of the efficiency of functioning of Ukrainian banks weighted by the method of the first principal component. In the course of the study, groups of efficiently and inefficiently operating banks were formed in the context of financial monitoring; the existing reserve and the potential for improving efficiency were determined both for the group of selected banks in general and for each individual bank. Clustering of banks was performed using the k-means method. The following is a graphical interpretation of the current position of specific banks relative to competitors in the environment of activity in the banking market in the context of various areas of strategic management.

The proposed model can be used when introducing supervision on the basis of assessing the efficiency of banking institutions in Ukraine in the context of their compliance with the requirements of regulatory legal acts on financial monitoring.

The described approach using Frontier Analyst allows for a comparative analysis of efficiency; building a visualization of information that is significant for further activities; carrying out

the efficient allocation of available resources; finding the information necessary when developing a planning strategy; determining the worst and best units of research; in-depth study of variables, characteristics and units of research.

5.3 Modelling the volatility of cryptocurrencies as a tool to counter the shadow economy and achieve inclusive growth

Today, the traditional financial market has undergone significant transformations. One of the crucial moments in its history was the emergence of cryptocurrencies. The cryptocurrencies are a special type of digital money that has own decentralized payment system and usually operates via blockchain technology. In 2008 when the first digital money appeared, the financial community did not take them seriously as units of account.

Now more and more companies accept them as payment for goods and services (Invest Funds, 2020). The cryptocurrency market and the financial market in general, is an example of a complex balanced system. On the one hand, it is chaotic, because its changes are defined under the influence of many participants, and on the other hand, it identifies and operates stable processes formed by the participants' actions. Therefore, it is important to identify and present the special properties of financial time series, which will distinguish such data from other natural processes and provide an opportunity to predict their behavior.

Although cryptocurrency prices are likely to be unpredictable, the risk is subordinated to a pattern expressed mathematically and simulate on a computer. For more than a century, financiers and economists have been engaged in this task, they analyze the risks in the capital markets, explain and quantify them. If earlier cryptocurrency was a local method of payment and was used by a limited number of people, now it is present on the Internet as an official means of money circulation. Bitcoin is the most popular among cryptocurrencies.

Although Bitcoin is currently the most popular cryptocurrency, the market is actively being developed and will

undoubtedly have a significant impact on the world economy. Banks and private companies are increasingly interested in using them, and the number of transactions is constantly growing. Therefore, it is relevant to analyze their behavior in the financial market and the forecasting possibility.

Today, there are more than 2,000 virtual currencies, the most popular of which are Bitcoin (BitCoin, or PTS) and Ethereum, which exist both as money and as payment systems (Kornieiev, 2018). Other cryptounits to some extent are its branches and have catch-up character. Bitcoin infrastructure is the most developed. They account for about 70% of the world's market value of digital assets, and trading volumes on exchanges reach $ 1.5 billion.

The second most popular cryptocurrency in the world is Ethereum, which allows using smart contract technology and creating decentralized applications. Its capitalization is over 18 billion dollars. Since Ethereum greatly simplifies and reduces the cost for blockchain implementation, it is being introduced by major players Microsoft, IBM, Acronis, the R3 banking consortium, and new startups (Invest Funds, 2020).

Given the above information, the relevant task is to find and develop special tools that will allow forecasting the exchange rates of modern cryptocurrencies. The topic of cryptocurrency research in the economic context is currently poorly developed. Such issues as analysis and prospects for the development of this market or the use of exchange analysis methods are mainly considered.

In Western economics, for a long time there were different views on the analysis of financial markets. As a result, there are two completely opposite directions: fundamental and technical analysis. Fundamental analysis, in most cases, is based on traditional theories that explain the market. However, in many

cases, the hypotheses that underlie economic theory, are powerless to explain certain processes occurring in the market, especially when forecasting future changes in prices and exchange rates. From the very beginning, technical analysis was formed as a certain experience gained empirically and had no clear theoretical justification. However, investigations made in the exact sciences at the turn of the third millennium allowed us to see the market from the other side.

The identification of stable processes explained the phenomenon that certain methods of technical analysis work and allow making real predictions. Consideration of financial markets as spatial and temporal fractals has expanded the tools of technical analysis of markets. Many practicing traders began to actively use the synergetic approach, chaos theory and fractal geometry (Forex Trade Portal, 2020). The most important class of natural fractals are chaotic time series, or time-ordered observations of the features of various natural, social and technological processes. Among them there are traditional (geophysical, economic, medical) and those that have become known recently. These series are generated by complex nonlinear systems that have a variety of natures. However, the nature of behavior is repeated on different scales. The most popular representatives are financial time series (primarily stock prices and exchange rates) (Forex Trade Portal, 2020).

The chaos theory began to be used in the XIX century, but this hypothesis was scientifically substantiated in the second half of the XX century in the works of E. Lorenz and B. Mandelbrot. In the mid-60's B. Mandelbrot developed fractal geometry, or geometry of nature, the main provisions of which set out in the work "Fractal Geometry of Nature" (Forex Trade Portal, 2020). He showed that the fractal theory helps to create very reasonable price charts of stock quotes or stock indices, and using fractal

dimension to assess the investing risks in certain stocks. In Peters' book, in addition to the description of the fractal market hypothesis, calculations which confirm that the modern market has a fractal nature, are performed. He also considers the fractal analysis of stock markets, bonds and currencies (TradingViev, 2018). There is no exact definition of "fractal" in the literature. A fractal is a geometric figure that can be divided into parts, where each part is a smaller copy of the original figure.

Fractals have certain properties, namely:

- irregular appearance of a fractal in time (the phenomenon is arbitrary and independent of time);
- self-similarity (each fractal reproduces itself on different timeframes of the schedule);
- dimensionality (property that defines the degree of fracture of the fractal line, on the price chart under the dimension, i.e., its volatility) (Korotchenko, 2019).

When studying the fractal properties of dynamic market indicators, the fractal dimension of the series is not usually calculated. Instead, the so-called R / S-analysis is performed (Rescaled range analysis), i.e., the Hurst exponent is calculated, which relates to the fractal dimension with the following ratio $D = 2 - H$, where D is the fractal dimension, and H is the Hurst exponent of the dynamic system.

One of the main advantages of R/S analysis is that, unlike many common statistical criteria, it is not based on any assumptions about the source data organization (the fact what distribution laws they obey). It is significant when we study such phenomena as stock prices or currencies, for which numerous studies confirm the obvious falsity of Gaussian approaches. The disadvantage of this method is that a large amount of data is required to obtain a reliable estimate of the Hurst exponent, otherwise the estimates may be incorrect (Goncharenko, 2015).

By performing R/S analysis, one can get two useful properties of the time series: the degree of randomness of the time series and the average cycle length. The average cycle length is the time which the system takes to get rid of the initial conditions. This indicator enables to estimate the inertia of the series. Hurst exponent also allows classifying time series according to the degree of their randomness:

– if H = 0.5, an efficient market hypothesis is confirmed, events are uncorrelated, and they are already used and depreciated by the market;
– if the Hurst exponent is 0 <H <1, but not equal to 0.5, then the series is a fractal and its behavior significantly differs from random wanderings;
– if H> 0,5, then the events occurring today will be considered in the market dynamics tomorrow, i.e., the market continues to take into account the received information and after the event. In this case, the market cannot be compared simply with autocorrelation since in the case of autocorrelation, the impact of information decreases rapidly (TradingViev, 2018.).

According to Hurst exponent, it is possible to draw conclusions about the risk degree of investing in an asset:

– if H is close to 1, the prices for the considered asset behave more predictably, so the level of risks related to this asset is lower;
– if H is close to 0, the behavior of prices is more unpredictable and chaotic, the level of risks related to the purchase of the asset is higher;
– if H = 0.5 the price movement is random (Brownian motion) (TradingViev, 2018).

The R/S analysis begins with the division of the input financial series into blocks of equal length, for each of which the

amplitude R and the standard deviation S are calculated. Then the R/S ratio is calculated for all blocks, the block size increases and the algorithm is repeated until the size of the block is equal to the size of the original financial series. As a result, we obtain the average value of R/S for each block size. Having performed the regression by the least squares method, we will find H.

We describe each step of the algorithm R/S-analysis in more detail (Baranovskyi, 2017):

1. The analysis begins with a time series of length M. Then it is transformed into a time series of length N = M - 1 using logarithmic relations (formula 5.5):

$$N_t = ln\frac{M_t}{M_{t-1}} \tag{5.5}$$

2. We divide this time period by A adjacent subperiods of length n, so that $A_n = N$. Then we denote each subperiod by I_a, considering that a = 1, 2, 3, ..., A. Each element in I_a is denoted N_k, with k = 1, 2, 3 ,. . . , N. We find the average value for each I_a of length n (formula 5.6):

$$E(I_a) = \frac{1}{n}\sum_{k=1}^{n} N_{k,a} \tag{5.6}$$

3. The time series of accumulated deviations $X_{k,a}$ from the average value for each subperiod I_a is calculated by formula 5.7:

$$X_{k,a} = \sum_{i=1}^{k}(N_{i,a} - E(I_a)) \tag{5.7}$$

4. The next step is to define the scope as the maximum value minus the minimum value of $X_{k,a}$, within each subperiod I_a (formula 5.8):

$$R_{I_a} = \max(X_{k,a}) - \min(X_{k,a}) \quad (5.8)$$

5. The next step calculates the sample standard deviation for each subperiod I_a (formula 5.9):

$$S_{I_a} = \sqrt{\frac{1}{n} \cdot \sum_{k=1}^{n} (N_{k,a} - E(I_a))^2} \quad (5.9)$$

6. Each range of R_{Ia} is normalized by dividing into the S_{Ia}. Therefore, the re-normalized amplitude during each I_a subperiod is equal to R_{Ia} / S_{Ia}. For a step above we obtained adjacent subperiods of length n. Therefore, the average value of R / S for length n is calculated by formula 5.10:

$$R/S_n = \frac{\sum_{a=1}^{A} R/S(A)}{A} \quad (5.10)$$

7. The length n increases to the next higher value, and (M - 1) / n is an integer value. We use values of n, including the start and end points of the time series, and steps 1-6 are repeated until n = (M - 1) / 2.

8. In the last step, it is possible to apply the equation log (R / S) = log (c) + Hlog (n), constructing a simple regression by the least squares method, given that log (n) is an independent variable, and log) - dependent variable. The least squares method is one of the methods of regression analysis to estimate

the unknown values based on the results of measurements. It contains random errors and is to minimize the sum of squares of deviations. The segment truncated on the coordinate axis is the estimate log (c), i.e. a constant. The slope of the equation is an estimate of the Hurst exponent - H. Fisher's statistics can be used to check the equation significance. It is also necessary to check the significance of the parameter H using Student's statistics.

For the analysis, it was decided to use bitcoin price statistics in relation to the dollar rate. Microsoft Exel is chosen as the software and the data range is 5 years from January 1, 2015 to January 26, 2019. Thus, a sample of 1821 elements is obtained. After its logarithmization, we obtained a series of length of 1820 values, the divisors of which are the numbers: 10, 13, 14, 20, 26, 28, 35, 52. 65, 70, 91, 130, 140, 182, 260, 364, 455, 910 .

R / S analysis is performed using formulas 1-6. Figure 5.34 demonstrates a fragment of the results for the iteration, when the divisor is 910.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	t	Mt	Nt	E(Ia)	Ni,a - E(Ia)	(Ni,a - E(Ia))^2	Xk,a	Ri,a	Si,a	R/S(A)	R/Sa	73,6772	Ia	910
2	1	314,25	-	-	-	-	-	-	-	-	a1	a2	E(Ia)	R/S(A)
3	2	315,03	0,00248	0,0023	0,00018	3,3E-08	0,00018	2,78297	0,03333403	83,4874299	2	911	0,002296	83,4874
4	3	281,08	-0,11403	0,0023	-0,11632	0,01353	-0,11614	2,78297	0,03333403	83,4874299	912	1821	0,001151	63,867
5	4	264,19	-0,06197	0,0023	-0,06427	0,00413	-0,18041	2,78297	0,03333403	83,4874299				
6	5	274,47	0,03817	0,0023	0,03588	0,00129	-0,14453	2,78297	0,03333403	83,4874299				
7	6	286,19	0,04181	0,0023	0,03952	0,00156	-0,10501	2,78297	0,03333403	83,4874299				
8	7	294,34	0,02808	0,0023	0,02578	0,00066	-0,07923	2,78297	0,03333403	83,4874299				
9	8	283,35	-0,03805	0,0023	-0,04035	0,00163	-0,11958	2,78297	0,03333403	83,4874299				
10	9	290,41	0,02461	0,0023	0,02231	0,0005	-0,09726	2,78297	0,03333403	83,4874299				
11	10	274,80	-0,05525	0,0023	-0,05755	0,00331	-0,15481	2,78297	0,03333403	83,4874299				
12	11	265,66	-0,03383	0,0023	-0,03612	0,0013	-0,19093	2,78297	0,03333403	83,4874299				
13	12	267,80	0,00802	0,0023	0,00573	3,3E-05	-0,18521	2,78297	0,03333403	83,4874299				
14	13	225,86	-0,17033	0,0023	-0,17262	0,0298	-0,35783	2,78297	0,03333403	83,4874299				
15	14	178,10	-0,23757	0,0023	-0,23987	0,05754	-0,59769	2,78297	0,03333403	83,4874299				
16	15	209,84	0,164	0,0023	0,1617	0,02615	-0,43599	2,78297	0,03333403	83,4874299				
17	16	208,10	-0,00833	0,0023	-0,01062	0,00011	-0,44661	2,78297	0,03333403	83,4874299				
18	17	199,26	-0,04341	0,0023	-0,0457	0,00209	-0,49232	2,78297	0,03333403	83,4874299				
19	18	210,34	0,05411	0,0023	0,05182	0,00269	-0,4405	2,78297	0,03333403	83,4874299				
20	19	214,86	0,02126	0,0023	0,01897	0,00036	-0,42153	2,78297	0,03333403	83,4874299				
21	20	211,31	-0,01666	0,0023	-0,01896	0,00036	-0,44049	2,78297	0,03333403	83,4874299				
22	21	226,90	0,07118	0,0023	0,06889	0,00475	-0,3716	2,78297	0,03333403	83,4874299				
23	22	233,41	0,02829	0,0023	0,02599	0,00068	-0,34561	2,78297	0,03333403	83,4874299				
24	23	232,88	-0,00227	0,0023	-0,00457	2,1E-05	-0,35018	2,78297	0,03333403	83,4874299				

Figure 5.34. Calculation fragments of the R / S indicator for $I_a = 910$

In Figure 5.34, the R / S indicator is highlighted in green and the iterations - in yellow. 18 iterations were performed in the analysis. Appendix A in Figures A.1 - A.17 presents calculations for other iterations. Annex B in Figures B.1 - B.2 demonstrates the functions used for calculations in MS Excel.

As a result, 18 R / S values were obtained, which are necessary for further construction of the regression equation. The calculated indicators obtained during the iterations are given in Table 5.18, which also represents the calculated Ln (R / S) and Ln (n). The obtained calculations enable to construct a graph and obtain the linear regression equation (Figure 5.35).

Table 5.18. Intermediate calculations

n	R/S	Ln(R/S)	Ln(n)
10	28,13841732	3,337135807	2,302585093
13	25,86542748	3,252907231	2,564949357
14	25,34104488	3,232425408	2,63905733
20	26,98620682	3,295325877	2,995732274
26	35,12077827	3,558792929	3,258096538
28	34,68839487	3,546405189	3,33220451
35	31,97867627	3,465069314	3,555348061
52	33,84316208	3,521736972	3,951243719
65	37,11240576	3,613951301	4,17438727
70	43,60978262	3,775281497	4,248495242
91	31,96553033	3,464658145	4,510859507
130	44,92566507	3,805009237	4,86753445
140	40,32761352	3,697036433	4,941642423
182	28,95037047	3,365583001	5,204006687
260	46,96894675	3,849486676	5,560681631
364	47,88063029	3,868711045	5,897153868
455	65,23732369	4,178031754	6,120297419
910	73,67722143	4,29969368	6,8134446

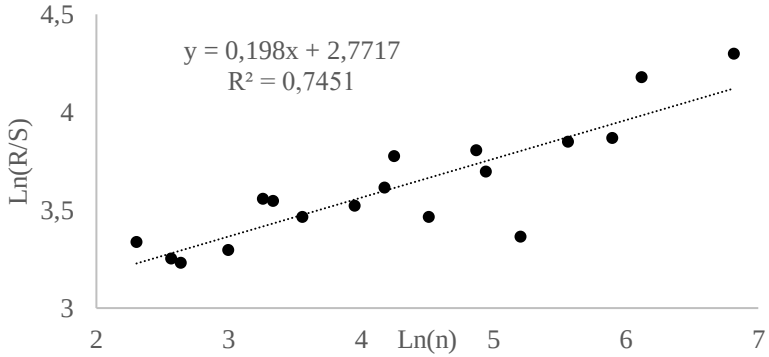


Figure 5.35. The regression equation graph

As we can see from the equation in Figure 2, the value of R2 = 0.7451, the regression equation describes the input data well. H = 0.198 <0.5, so the series is anti-persistent and has no long-term memory, i.e., the information obtained in the past does not affect its behavior in the future. For example, if the system shows an increase in the previous period, it is more likely than the greater Hurst exponent is less than 0.5, the decline begin in the next period.

After that we check the result for significance by calculating the Student's and Fisher's criteria using "Data Analysis" (Figure 5.36).

Regression statistics	
Multiple R	0,863199554
R-square	0,74511347
Normalized R-square	0,729183062
Standard error	0,157351775
Observations	18

Analysis of variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1,158080647	1,158080647	46,77303084	3,97952E-06
Residue	16	0,396153297	0,024759581		
Total	17	1,554233944			

	Coefficients	*Standard error*	*t-statistics*	*P-Value*	*Lower 95%*	*Upper 95%*
Y-intersection	2,771743878	0,129202209	21,45275921	3,23725E-13	2,49784743	3,045640325
Variable X 1	0,198028375	0,028955407	6,83908114	3,97952E-06	0,136645655	0,259411095

Figure 5.36. Basic statistical features of the regression equation

The obtained Fisher's test, which is equal to 46.7730 (Figure 5.36), exceeds the tabular value at a significance level of 0.05 and freedom levels k1 = 1, k2 = 16, i.e. 4,494. It rejects the hypothesis regarding the absence of a linear relationship at the appropriate level of significance p <3.97952E-06, that indicates the adequacy of the model.

The obtained Student's criteria for regression indicators exceed the tabular value at a significance level of 0.05 and a freedom level of k = 16, i.e. 2.1199. It indicates the statistical significance of the regression parameters. The P-level for all assessments is less than 0.05 that confirms their significance for the model.

Since the obtained equation is accurate, its parameters are statistically significant and the obtained value of the Hurst exponent is less than 0.5, the Bitcoin exchange rate data can be formed by the ARIMA-model.

One of the methods of time series analysis is the autoregression and moving average models, which are especially useful for describing and predicting processes that detect uniform fluctuations around the mean value. The ARIMA model is one of the most popular models for making short-term forecasts. Three groups of parameters are used to describe this model: p, d and q are non-negative integers that characterize the order for parts of the model (respectively autoregressive, integrated and moving average).

In the process of time series analysis, the first step as a rule defines the series integration order (parameter d of the ARIMA process (p, d, q). This parameter d is set equal to 0 and 1.

The case d = 0 corresponds to the short memory of the series. Then if d = 1, we can conclude about infinite memory. In terms of the infinite memory, we mean that each shock affects the behavior of a series for an infinitely long time. The existence of

short memory means that the effects of shock disappear quickly. ARMA processes (p, q) and ARIMA processes (p, d, q) are special cases at d = 0 and d = 1, respectively (Zaporozhchuk, 2018).

The methodology to form the studied time series includes the following main stages:

– identification of the test model;
– evaluation of model parameters and diagnostic verification of model adequacy;
– use of the model for forecasting.

Construction of the correct time series model requires their stationarity. At this stage, it is recommended to analyze the autocorrelation function and the private autocorrelation function.

If the initial series are not stationary, before performing the evaluation of the model, it is necessary to bring the considered series to a stationary form. Typically, the time series difference operator is used, thereby determining the value of the parameter d.

We use the analytical package STATISTICA, implemented for analysis, management, extraction and visualization of data, to build the ARIMA model.

In the first step we will build the input data graph - the Bitcoin rate. In most time series, the members of the series depend on each other, as can be seen in Figure 5.37.

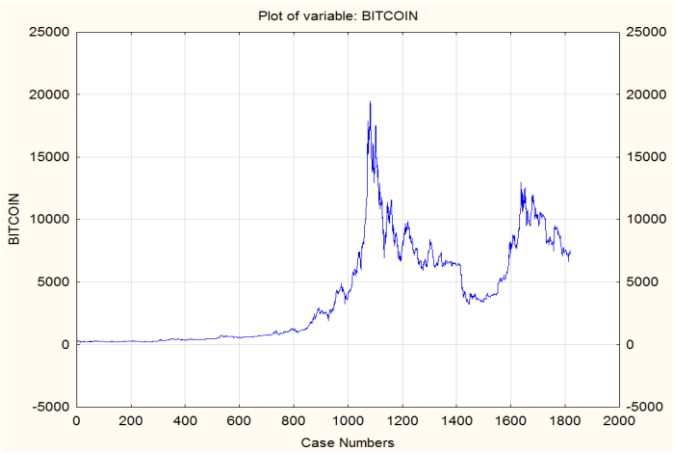


Figure 5.37. Graph of Bitcoin variable

Figure 5.37 demonstrates the uneven oscillations that lead to an increase in amplitude. Therefore, it is necessary to logarithm the input data to obtain a more uniform amplitude (Fig. 5.38). (Holmes et al.)

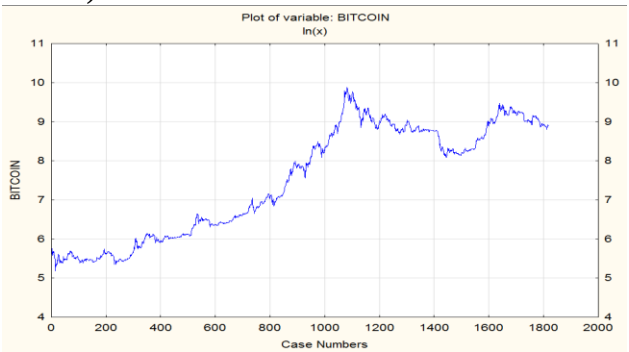


Figure 5.38. Graph of the Bitcoin logarithmic variable

The graph shows that the goal of the transformation has been achieved, the amplitude of oscillations has become more stable and the series is ready for further study.

We construct an autocorrelation function and a private autocorrelation function (Fig. 5.39-5.40) to identify the ARIMA model.

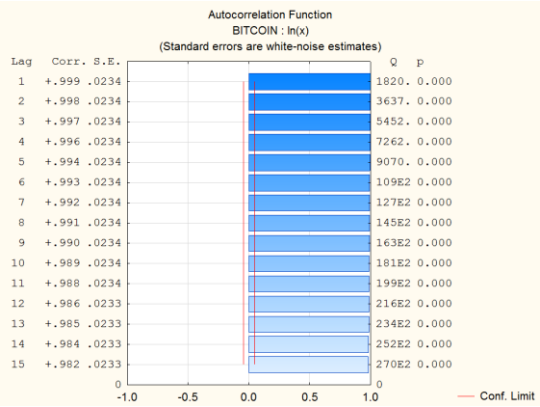


Figure 5.39. Autocorrelation function for Bitcoin logarithmic variable

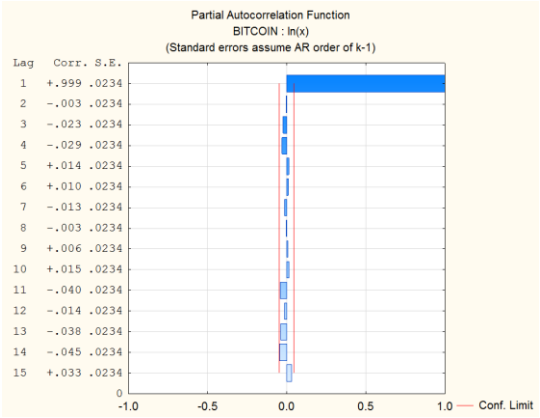


Figure 5.40. Private autocorrelation function for Bitcoin logarithmic variable

The correlogram of the autocorrelation function shows a strong correlation dependence of the series levels (Fig. 5.39). As one can see from the graph of the private autocorrelation function correlogram (Fig. 5.40), all autocorrelation

coefficients, except the first, are statistically insignificant. The obtained correlograms indicate that the series contains a trend, i.e. it is non-stationary.

We will conduct a Dickey-Fuller test for confirmation. Thus, we take the first differences of our series and calculate the parameters of the following equations: the test regression equation without a constant and trend (formula 5.11); regression equation with a constant but without trend (formula 5.12); regression equation with a constant and linear trend (formula 5.13).

..

$$\Delta y_t = b \cdot y_{t-1} + \varepsilon_t, \quad (5.11)$$

$$\Delta y_t = b_0 + b \cdot y_{t-1} + \varepsilon_t, \quad (5.12)$$

$$\Delta y_t = b_0 + b_1 \cdot t + b \cdot y_{t-1} + \varepsilon_t, \quad (5.13)$$

where: $\Delta y_t = y_t - y_{t-1}$;

y_t - time series of actual data;

y_{t-1} - time series shifted by one step;

b, b_0, b_1 – regression parameters;

ε_t – random error.

We use the possibilities of "Data Analysis" in MS Excel to find the parameters for regressions 7-9. Thus, the following parameters for regression 7 are obtained (Figure 5.41).

Regression statistics	
Multiple R	0,016661819
R-square	0,000277616
Normalized R-square	-0,000272136
Standard error	287,1551977
Observations	1820

Analysis of variance

	df	SS	MS	F	Significance F
Regression	1	41651,58135	41651,58135	0,505124148	0,477348392
Residue	1819	149991297,7	82458,10758		
Total	1820	150032949,3			

	Coefficients	Standard error	t-statistics	P-Value	Lower 95%	Upper 95%
Y-intersection	0	#Н/Д	#Н/Д	#Н/Д	#Н/Д	#Н/Д
Variable X 1	-0,000852389	0,001199331	-0,710720865	0,477348342	-0,003204599	0,001499821

Figure 5.41. Parameters for the regression equation without a constant and a trend

The obtained values of the parameter b are compared with the table (-2.58). Since the value of the parameter b (-0.000852389) is to the right of the tabular value, the null hypothesis regarding a single root is accepted, the process is non-stationary.

We obtain the following parameter values for regression 8 (Figure 5.42).

Regression statistics	
Multiple R	0,036602968
R-square	0,001339777
Normalized R-square	0,000790459
Standard error	287,0563269
Observations	1820

Analysis of variance

	df	SS	MS	F	Significance F
Regression	1	200975,437	200975,437	2,438982783	0,118526998
Residue	1818	149805626,7	82401,33483		
Total	1819	150006602,2			

	Coefficients	Standard error	t-statistics	P-Value	Lower 95%	Upper 95%
Y-intersection	14,22267481	9,474938539	1,501083596	0,133507591	-4,360235227	32,80558486
Variable X 1	-0,002636566	0,00168824	-1,561724298	0,118526998	-0,005947661	0,000674529

Figure 5.42. Parameters for the regression equation with a constant and without trend

The value of the parameter b is compared with the table (-3,43). Since the value of the parameter b (-0,002636566) is to the right of the tabular value, the null hypothesis regarding a single root is accepted, the process is non-stationary.

We find parameter b for regression 9 (Figure 5.43).

Regression statistics	
Multiple R	0,056037106
R-square	0,003140157
Normalized R-square	0,002042898
Standard error	286,876368
Observations	1820

Analysis of variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	471044,3157	235522,1579	2,861819403	0,057422365
Residue	1817	149535557,8	82298,05054		
Total	1819	150006602,2			

	Coefficients	*Standard error*	*t-statistics*	*P-Value*	*Lower 95%*	*Upper 95%*
Y-intersection	-4,336840581	13,95090833	-0,310864388	0,755939375	-31,69834467	23,02466351
Variable X 1	0,036385276	0,020085525	1,811517345	0,070225854	-0,003007869	0,075778422
Variable X 2	-0,006332979	0,002647688	-2,391890504	0,016862959	-0,011525811	-0,001140147

Figure 5.43. Parameters for the regression equation with a constant and a trend

The received values of the parameter b are compared with the table (-3.96). Since the value of the parameter b (-0,006332979) is to the right of the tabular value, the null hypothesis regarding a single root is accepted, the process is non-stationary.

The results of the Dickey-Fuller test confirm that the process is non-stationary. We perform differentiation of the series with lag 1 to eliminate the dependence. As a result, each element of the transformed series will represent the difference between its previous and next values (Fig. 5.44).

We consider the corresponding autocorrelation and private autocorrelation functions (Figure 5.45-5.46).

Correlograms show that the trend component is removed from the model because the obtained values of the function are close to 0 and are not significant, i.e. the series is stationary.

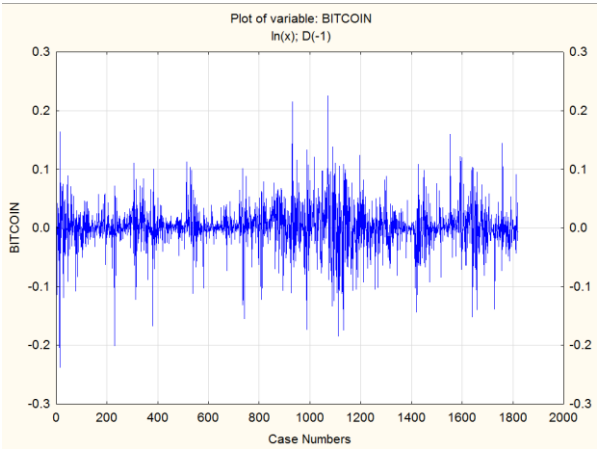


Figure 5.44. Graph of the Bitcoin variable after taking the first differences

Based on the exploratory analysis, we can conclude that the non-seasonal model (with lag 1) is quite suitable for the transformed series. Therefore, we build an ARIMA-model for a series in the first differences evaluating the parameters of the variable average in the ARIMA model: d, p and q.

Since the autocorrelation function in Figure 5.45 and the private autocorrelation function in Figure 5.46 are similar, the model has an autoregressive component and a moving average. First, we conduct an assessment for p = 1 and q = 1, because this type of ARIMA-model is peculiar for the obtained correlograms 12 and 13.

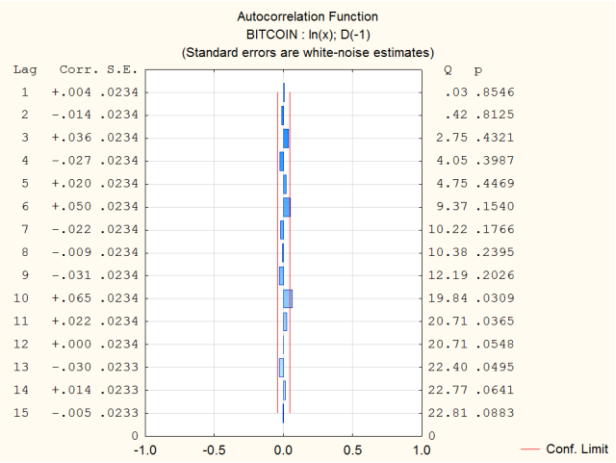


Figure 5.45. Autocorrelation function after taking the first differences

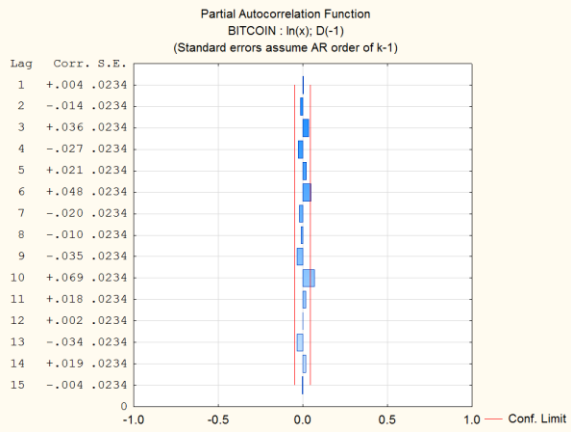


Figure 5.46. Private autocorrelation function after taking the first differences

We obtain the following results after conducting ARIMA evaluation (1, 1, 1) (Figure 5.47).

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(1,1,1) MS Residual= .00151 **Param.**	Asympt. Std.Err.	Asympt. t(1818)	p	Lower 95% Conf	Upper 95% Conf
p(1)	-0.625068	0.223571	-2.79583	0.005231	-1.06355	-0.186584
q(1)	-0.644153	0.218442	-2.94886	0.003230	-1.07258	-0.215730

Figure 5.47. Table of results with assessments of model parameters (1, 1, 1)

Figure 5.47 demonstrates that the assessment parameters are statistically significant, because p <0.5 and 95% confident interval does not contain zero values.

We construct models with other parameters to make sure that the selected model has the best assessments. The results of calculations and parameter values are shown in Fig. 5.48-5.53.

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(0,1,1) MS Residual= .00151 **Param.**	Asympt. Std.Err.	Asympt. t(1819)	p	Lower 95% Conf	Upper 95% Conf
q(1)	-0.006419	0.023684	-0.271006	0.786417	-0.052870	0.040033

Figure 5.48. Table of results with model parameter estimates (0, 1, 1)

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(1,1,0) MS Residual= .00151 **Param.**	Asympt. Std.Err.	Asympt. t(1819)	p	Lower 95% Conf	Upper 95% Conf
p(1)	0.006255	0.023504	0.266104	0.790189	-0.039844	0.052353

Figure 5.49. Table of results with model parameter estimates (1, 1, 0)

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(2,1,1) MS Residual= .00151 **Param.**	Asympt. Std.Err.	Asympt. t(1817)	p	Lower 95% Conf	Upper 95% Conf
p(1)	-0.549468	0.219964	-2.49799	0.012578	-0.980878	-0.118059
p(2)	-0.023216	0.024242	-0.95766	0.338361	-0.070761	0.024330
q(1)	-0.556463	0.218911	-2.54196	0.011106	-0.985806	-0.127119

Figure 5.50. Table of results with model parameter estimates (2, 1, 1)

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(1,1,2) MS Residual= .00151 **Param.**	Asympt. Std.Err.	Asympt. t(1817)	p	Lower 95% Conf	Upper 95% Conf
p(1)	-0.524999	0.235965	-2.22490	0.026210	-0.987792	-0.062207
q(1)	-0.533036	0.236042	-2.25823	0.024050	-0.995978	-0.070094
q(2)	0.021581	0.023649	0.91254	0.361605	-0.024801	0.067963

Figure 5.51. Table of results with model parameter estimates (1, 1, 2)

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),D(1) Model:(2,1,2) MS Residual= .00150 **Param.**	Asympt. Std.Err.	Asympt. t(1816)	p	Lower 95% Conf	Upper 95% Conf
p(1)	-1.76905	0.040556	-43.6197	0.00	-1.84859	-1.68950
p(2)	-0.90564	0.037455	-24.1796	0.00	-0.97910	-0.83218
q(1)	-1.79788	0.035596	-50.5082	0.00	-1.86769	-1.72807
q(2)	-0.93116	0.032094	-29.0137	0.00	-0.99411	-0.86822

Figure 5.52. Table of results with model parameter estimates (2, 1, 2)

Paramet.	Input: BITCOIN (BITCOIN.sta) Transformations: ln(x),2*D(2) Model:(2,2,2) MS Residual= .00221 **Param.**	Asympt. Std.Err.	Asympt. t(1813)	p	Lower 95% Conf	Upper 95% Conf
p(1)	0.611697	0.023857	25.6407	0.000000	0.564908	0.658487
p(2)	-0.322432	0.023462	-13.7424	0.000000	-0.368448	-0.276415
q(1)	-0.041082	0.012121	-3.3894	0.000716	-0.064854	-0.017310
q(2)	0.913650	0.012002	76.1236	0.000000	0.890110	0.937189

Figure 5.53. Table of results with model parameter estimates (2, 2, 2)

The obtained estimates (Fig. 5.48-5.51) are statistically insignificant. When we checked the model (2, 2, 2) (Fig. 5.53), it was found that the p-statistic for the Luing-Box test calculated for the residuals is less than 0.05, which indicates the inadequacy of the model. Checking the p-statistics of the Luing-Box test for the model (1, 1, 1) showed that its value for 10, 11, 13 lags is less than 0.5. P- statistics for the model (2, 1, 2) are more than 0.05. It shows that model (2, 1, 2) is adequate. It confirms the correctness of our chosen ARIMA-model with parameters (2, 1, 1).

Using the obtained model, we calculate the forecasts starting from the last observation. The table of results contains the predicted 20 values and their confidence intervals. We will also construct a graph considering the predicted values.

Forecasts; Model:(2,1,2) Seasonal lag: 12 (BITCOIN.sta)
Input: BITCOIN
Start of origin: 1 End of origin: 1821

CaseNo.	Forecast	Lower 90.0000%	Upper 90.0000%
1822	7224.779	6778.002	7701.005
1823	7245.852	6611.715	7940.810
1824	7221.436	6457.838	8075.325
1825	7245.548	6365.989	8246.631
1826	7225.000	6252.036	8349.380
1827	7239.502	6178.716	8482.409
1828	7232.444	6093.797	8583.852
1829	7231.790	6022.655	8683.676
1830	7239.340	5960.985	8791.844
1831	7226.581	5889.378	8867.400
1832	7242.320	5842.493	8977.538
1833	7226.035	5774.539	9042.381
1834	7240.589	5733.058	9144.532
1835	7229.586	5674.062	9211.552
1836	7235.864	5631.131	9297.907
1837	7234.719	5583.632	9374.034
1838	7231.059	5537.001	9443.418
1839	7238.573	5499.439	9527.687
1840	7228.598	5451.112	9585.681
1841	7239.441	5419.027	9671.387

Figure 5.54. Table of predicted values for Bitcoin variable

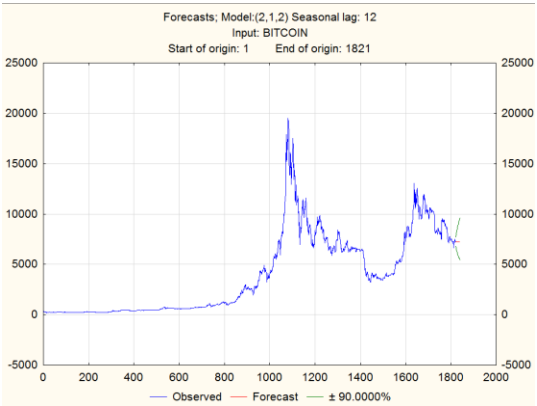


Figure 5.55. Graph of predicted values for Bitcoin variable

It is necessary to verify the model to test how well it predicts the last 20 observations. There are two assumptions of the ARIMA model:

- residuals (observed values minus estimated ones) are normally distributed;

- residuals are independent of each other, i.e., there is no residual correlation between them.

If the last condition is not met, it is probably that some additional parameter that affects the series is not considered. Below there are the graph of residuals, the normal probability graph for the variable and the normal graph without trend, and histogram of the residual's distribution (Fig. 5.56-5.59), used to visually confirm the residuals normality.

It is possible to draw the following conclusions from the constructed graphs:

- the residuals form a "white noise" (Fig. 5.56);

- not all residuals are on the probability graph line, that indicates the presence of emissions (Fig. 5.57);

- since the trend is excluded, the distribution in Figure 5.58 indicates normality, because the data are evenly distributed;

- histogram shows the normal distribution of residuals (Fig. 5.59).

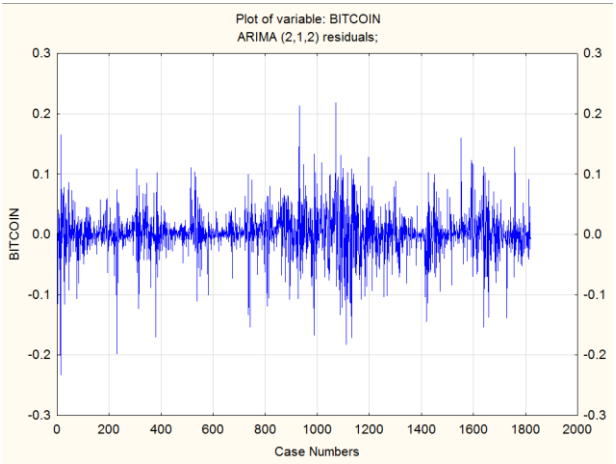


Figure 5.56. Graph of residuals for the Bitcoin variable

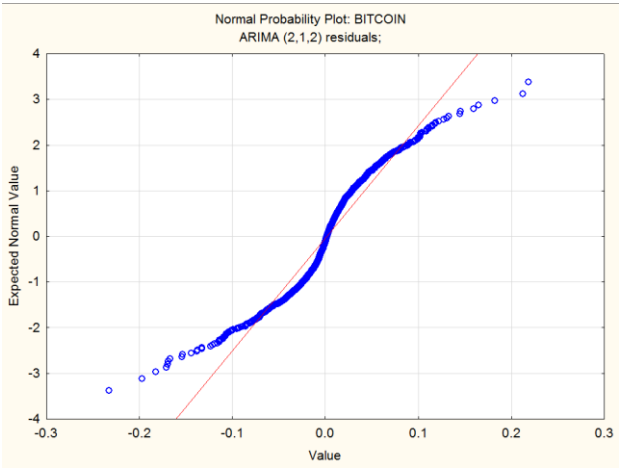


Figure 5.57. Normal probability graph for the Bitcoin variable

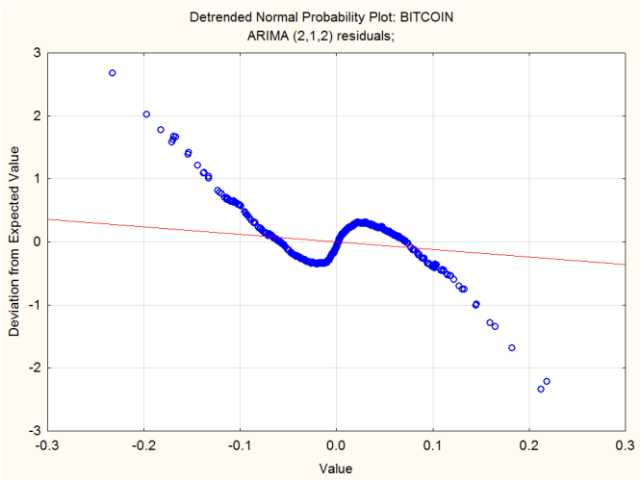


Figure 5.58. Normal probability graph without a trend for the Bitcoin variable

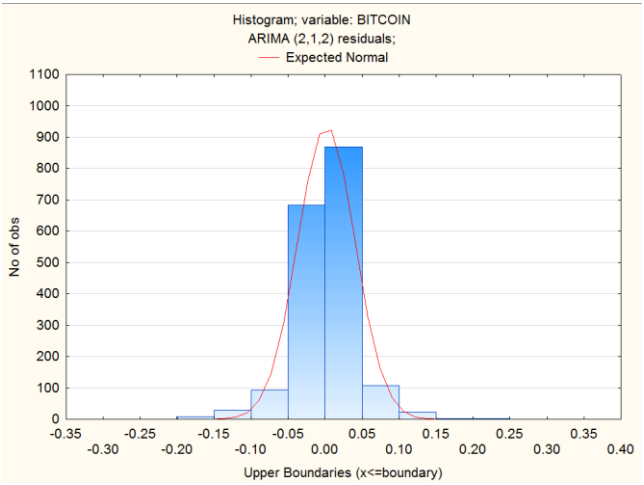


Figure 5.59. Histogram of residuals for the Bitcoin variable

Now we consider the fulfillment of the second ARIMA assumption - the residuals are independent of each other. The independence of the residuals is checked using the

autocorrelation function graph (Fig. 5.60). The graph shows that. there is no correlation between the residuals, because the autocorrelation function value is close to 0.

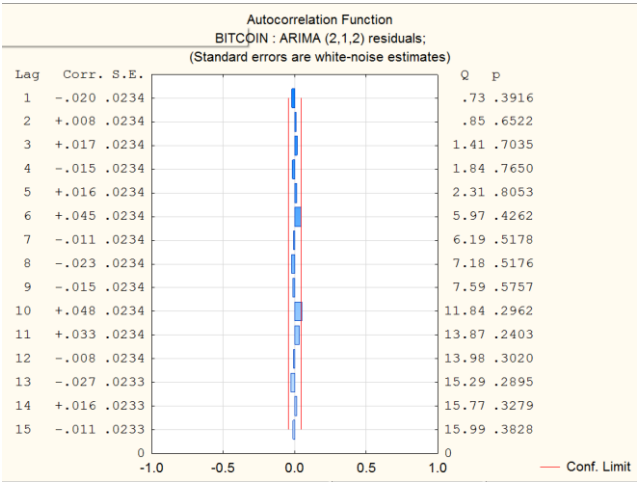


Figure 5.60. Graph of residuals autocorrelation function

The last stage is to check the adequacy of our model by comparing the obtained predicted values with the actual ones for this period. Table 5.19 shows the data.

Table 5.19. Actual and predicted data on the Bitcoin exchange rate from December 27 to January 15, 2020.

Data	Actual exchange rate of Bitcoin	Predicted exchange rate of Bitcoin	Lower interval	Upper interval	Deviation of the predicted course from the actual rate
27.12.2019	7 290,09	7 224,78	6 778,00	7 701,01	-0,90%
28.12.2019	7 317,99	7 245,85	6 611,72	7 940,81	-0,99%
29.12.2019	7 422,65	7 221,44	6 457,84	8 075,33	-2,71%
30.12.2019	7 293,00	7 245,55	6 365,99	8 246,63	-0,65%

Data	Actual exchange rate of Bitcoin	Predicted exchange rate of Bitcoin	Lower interval	Upper interval	Deviation of the predicted course from the actual rate
31.12.2019	7 193,60	7 225,00	6 252,04	8 349,38	0,44%
01.01.2020	7 200,17	7 239,50	6 178,72	8 482,41	0,55%
02.01.2020	6 985,47	7 232,44	6 093,80	8 583,85	3,54%
03.01.2020	7 344,88	7 231,79	6 022,66	8 683,68	-1,54%
04.01.2020	7 410,66	7 239,34	5 960,99	8 791,84	-2,31%
05.01.2020	7 411,32	7 226,58	5 889,38	8 867,40	-2,49%
06.01.2020	7 769,22	7 242,32	5 842,49	8 977,54	-6,78%
07.01.2020	8 163,69	7 226,04	5 774,54	9 042,38	-11,49%
08.01.2020	8 079,86	7 240,59	5 733,06	9 144,53	-10,39%
09.01.2020	7 879,07	7 229,59	5 674,06	9 211,55	-8,24%
10.01.2020	8 166,55	7 235,86	5 631,13	9 297,91	-11,40%
11.01.2020	8 037,54	7 234,72	5 583,63	9 374,03	-9,99%
12.01.2020	8 192,49	7 231,06	5 537,00	9 443,42	-11,74%
13.01.2020	8 144,19	7 238,57	5 499,44	9 527,69	-11,12%
14.01.2020	8 827,76	7 228,60	5 451,11	9 585,68	-18,12%
15.01.2020	8 807,01	7 239,44	5 419,03	9 671,39	-17,80%

As you can see, the first 10 values were predicted quite accurately (error is less than 5%). With further values, starting from 06.01.2020, the prediction quality decreases since the exchange rate shifted sharply on January 7-8, and then it began to grow further.

Thus, we can conclude that the obtained ARIMA model is adequate and accurately predicts the value within one period. It is suitable for short-term forecasting because it does not consider significant changes in exchange rates occurring in the international market.

The study deals with a topical issue since forecasting the cryptocurrency rate is one of the urgent needs of financial markets. This issue is being studied at a sufficient level, but

requires the search for new effective tools. Time series modeling and forecasting form one of these tools since changes in the cryptocurrency rate are caused by changes in the time and structure of the series.

This scientific work analyzes models of time series forecasting with variable fractal structure. Authors decided to use R / S analysis to determine the presence or absence of long-term memory in the data. Summarizing the numerical study results, Hurst exponent of less than 0.5 is obtained. Therefore, we can conclude that a number of the analyzed data is a normally distributed random variable. The studied series does not have long-term memory, indicating the course behavior be more chaotic and unpredictable, and increased risk for Bitcoin transactions.

The next step is to build the ARIMA model using the STATISTICA software package. As a result, it is proved that ARIMA is the most adequate model (2, 1, 2). Using the obtained model, which estimates the parameters of the analyzed series, a system of forecast estimates for the short-term period is developed. The error of the first 10 values is within 5%. Thus, it is proved that these models with a high reliability level predicts the future position in the observed market in the short term, and therefore their use is quite promising in modeling future parameters of the Bitcoin market.

6. ENVIRONMENTAL TAX POLICY FOR INCLUSIVE GROWTH: CHALLENGES AND OPPORTUNITIES

6.1 Environmental tax policy in the European Union: on the way to inclusive growth

The necessity to preserve the environment determines the relevance of implementation of the special methods of conducting ecologically related economic activities, focused on maintaining the quality of the natural components under appropriate conditions. This is a primary task of the environmental tax policy. Environmental tax policy is a central pillar of effective and sustainable growth in the European Union countries. It provides incentives for further efficiency gains, green investment and innovations. The assessment of factors influencing the effectiveness of environmental tax reforms, in particular in the countries of the European Union, is of particular scientific concern. European experience in environmental tax management can be borrowed by transformational economies, Ukraine in particular, as an excellent practice of adapting to international environmental standards.

The Europe 2020 strategy (Europe, 2010) outlines a comprehensive program to transform the European Union's economy into a resource-efficient one. The goals of sustainable growth are achieved through the implementation of the flagship initiative "Resource Efficient Europe", which aims at reducing the dependence of economic growth on the use of natural resources (reducing resource intensity in production and consumption), achieving a low level of CO_2 emissions (low carbon economy), stimulating the use of renewable energy sources, modernizing the transport sector and promoting efficient energy use. In the context of the European integration,

it is important for Ukraine to join the implementation of the new, advanced European resource-saving initiatives and borrow from the successful experience of economic regulation of environmentally related business activities.

Environmental taxes in the European Union are deeply categorized (Table 6.1).

Table 6.1. Classification of environmental taxes in the EU (Statistical guide, 2013)

Tax base	List of taxes
Energy (including fuel for transport)	1. Energy products for transport purposes: • unleaded petrol; • leaded petrol; • diesel; • other energy products for transport purposes 2. Energy products for stationary purposes: • light fuel oil; • heavy fuel oil; • natural gas; • coal; • coke; • biofuels; • electricity consumption and production; • district heat consumption and production; • other energy products for stationary use 3. Greenhouse gases: • carbon content of fuels; • emissions of greenhouse gases
Transport (excluding fuel for transport)	1. Motor vehicles import or sale (one off taxes). 2. Registration or use of motor vehicles, recurrent. 3. Road use (e.g. motorway taxes). 4. Congestion charges and city tolls (if taxes in national accounts). 5. Other means of transport (ships, airplanes, railways, etc.). 6. Flights and flight tickets. 7. Vehicle insurance (excludes general insurance taxes).

Pollution	1. Measured or estimated emissions to air: • measured or estimated NOx emissions; • measured or estimated SOx emissions; • other measured or estimated emissions to air (excluding CO2) 2. Ozone depleting substances (e.g. CFCs or halons). 3. Measured or estimated effluents to water: • measured or estimated effluents of oxydisable matter (BOD, COD); • other measured or estimated effluents to water; • effluent collection and treatment, fixed annual taxes 4. Non-point sources of water pollution: • pesticides (based on e.g. chemical content, price or volume); • artificial fertilisers (based on e.g. phosphorus or nitrogen content or price); • manure 5. Waste management: • collection, treatment or disposal; • individual products (e.g. packaging, beverage containers, batteries, tyres, lubricants) 6. Noise (e.g. aircraft take-off and landings).
Resources	1. Water abstraction. 2. Harvesting of biological resources (e.g. timber, hunted and fished species). 3. Extraction of raw materials (e.g. minerals, oil and gas). 4. Landscape changes and cutting of trees.

According to the Tax Code of Ukraine, the environmental tax consists of:

1. Revenues from emissions of pollutants into the atmosphere by stationary sources of pollution;

2. Revenues from discharges of pollutants into water sources;

3. Environmental tax, which is paid for the disposal of waste (except for the disposal of certain types (classes) of waste as

secondary raw materials in their own territories (facilities) of economic entities);

4. Revenues from the generation of radioactive waste (including already accumulated);

5. Proceeds from the temporary storage of radioactive waste by their producers beyond the period established by the special conditions of the license.

Comparing the structure of objects of ecological taxation in Ukraine and the countries of the European Union, it should be noted that the Ukrainian ecological tax policy remains limited, which constrains the fiscal and regulatory potential of environmental taxes. Currently, about 500 types of environmental taxes are applied in foreign countries. Based on the peculiarities of the application of environmental taxes, we can determine the list of their main tasks:

1. Targeted financing, where environmental taxes are accumulated in a separate environmental budget, the funds of which are used exclusively for their intended purpose (experience of Switzerland);

2. Encouraging enterprises to introduce innovative technologies to reduce the negative impact on the environment, thereby increasing subsidies for the payment of mandatory payments (experience of Denmark, Spain etc.);

3. Institution building, strengthening the efficiency of public administration in the field of environmental protection, improving domestic policies aimed at reducing emissions (experience of Latvia).

Let’s analyze how the EU copes with sustainable development goals on its way to effective and inclusive growth. In the paper (Khanova Ye. and Skibina S., 2017) there was an attempt to assess the sustainable development of the EU countries in terms of specific components – economic, social and environmental ones. There were selected five indicators,

which represented those three components: Index of Economic Freedom, Global Competitiveness Index, Human Development Index, Quality-of-Life Index, and Environmental Performance Index. Research findings are shown in the Table 6.2.

Table 6.2. Sustainable development indices related to the EU countries (Khanova Ye. and Skibina S., 2017)

Country	1	2	3	4	5
Austria	5,2	72,3	190,37	0,839	86,64
Belgium	5,3	67,8	160,52	0,896	80,15
Bulgaria	4,4	67,9	138,20	0,794	83,40
Greece	4,0	55,0	148,32	0,866	85,81
Denmark	5,3	75,1	184,92	0,925	89,21
Estonia	4,8	79,1	171,09	0,865	88,59
Ireland	5,2	76,7	166,90	0,923	86,60
Spain	4,7	63,6	183,65	0,884	88,91
Italy	4,5	62,5	142,52	0,887	84,48
Cyprus	4,0	67,9	0	0,856	80,24
Latvia	4,4	74,8	0	0,830	85,71
Lithuania	4,6	75,8	130,28	0,848	85,49
Luxembourg	5,2	75,9	0	0,898	86,58
Malta	4,5	67,7	0	0,856	88,48
Netherlands	5,6	75,8	175,23	0,924	82,03
Germany	5,6	73,8	189,74	0,926	84,26
Poland	4,6	68,3	150,21	0,855	81,26
Portugal	4,5	62,6	178,43	0,843	88,63
Romania	4,3	69,7	143,04	0,802	83,24
Slovakia	4,3	65,7	152,55	0,845	85,42
Slovenia	4,4	59,2	175,45	0,890	88,98
Hungary	4,2	65,8	138,82	0,836	84,60
Finland	5,4	74,0	182,93	0,895	90,68
France	5,2	63,3	160,25	0,897	88,20
Croatia	4,1	59,4	170,63	0,827	86,98
Czech Republic	4,7	73,3	165,41	0,878	84,67
Sweden	5,5	74,9	172,74	0,913	90,43

The components of the EU's sustainable development are reflected in the Table 6.3.

Table 6.3. Components of sustainable development of the EU countries (Khanova Ye. and Skibina S., 2017)

Country	Economic component	Social component	Environ-mental component	Sustainable develop-ment index
Austria	1,10	1,15	1,04	**3,29**
Belgium	1,07	1,05	0,96	3,08
Bulgaria	0,98	0,91	1,00	2,89
Greece	0,84	0,99	1,03	2,86
Denmark	1,13	1,15	**1,07**	**3,35**
Estonia	1,10	1,07	1,07	3,24
Ireland	1,13	1,08	1,04	3,25
Spain	0,98	1,12	1,07	3,17
Italy	0,95	0,98	1,02	2,94
Cyprus	0,94	0,44	0,96	2,34
Latvia	1,03	0,42	1,03	2,48
Lithuania	1,06	0,91	1,03	3,00
Luxembourg	1,12	0,46	1,04	2,62
Malta	0,99	0,44	1,06	2,49
Netherlands	1,17	1,11	0,99	3,27
Germany	1,15	1,17	1,01	**3,33**
Poland	1,00	0,99	0,98	2,97
Portugal	0,95	1,08	1,07	3,10
Romania	0,98	0,93	1,00	2,92
Slovakia	0,95	0,99	1,03	2,97
Slovenia	0,91	1,10	1,07	3,08
Hungary	0,94	0,94	1,02	2,89
Finland	1,13	1,13	**1,09**	**3,35**
France	1,03	1,05	1,06	3,14
Croatia	0,88	1,05	1,05	2,98
Czech Republic	1,05	1,05	1,02	3,12
Sweden	1,15	1,10	**1,09**	**3,34**

Let's dwell attention on how the European Union countries achieve sustainable development goals via environmental tax

policy. Environmentally related tax revenue in the EU Member States is represented in the Table 6.4.

Table 6.4. Environmentally related tax revenue in the EU Member States (Compare, 2018)

Country	Compared to GDP, %	As a share of total tax revenue, %
Austria	2,43	5,75
Belgium	2,20	5,01
Bulgaria	2,39	8,03
Greece	3,68	9,51
Denmark	3,63	8,09
Estonia	2,73	8,33
Ireland	1,57	7,01
Spain	1,84	5,26
Italy	3,31	7,90
Cyprus	2,79	8,30
Latvia	3,56	11,39
Lithuania	2,01	6,65
Luxembourg	1,73	4,41
Malta	2,58	7,96
Netherlands	3,34	8,61
Germany	1,79	4,62
Poland	2,50	7,14
Portugal	2,60	7,45
Romania	2,09	7,72
Slovakia	2,09	6,30
Slovenia	4,54	12,42
Hungary	2,42	6,70
Finland	2,93	6,92
France	2,34	5,05
Croatia	4,22	10,97
Czech Republic	2,66	7,53
Sweden	1,85	4,26

Let’s conduct macroeconomic performance analysis of the environmental tax policy in the European Union countries.

As the research object is a macroeconomic policy, we propose to distinguish between the macroeconomic parameters grouped in the following way:

1. Internal macroeconomic factors: nominal GDP, real GDP, inflation, budget deficit, energy consumption.

2.External macroeconomic factors: public debt, exports, foreign direct investments.

3.Institutional macroparameters: ecological culture (productivity of resources), shadow economy, trust in government.

4. Fiscal macroparameters: tax culture, fiscal freedom.

Research findings based on correlation analysis are represented in the Tables 6.5–6.8.

Table 6.5. Assessment of the impact of internal macroeconomic factors on environmental tax policy in the EU countries (authors' calculations based on (Official web-site, 2019)

Tax base	Nominal GDP	Real GDP	Inflation	Budget deficit	Energy consumption
Energy	0,9916	0,7306	-0,6915	0,6987	-0,8192
Pollution	0,9544	0,8016	-0,4951	0,8602	-0,6792
Resources	0,8776	0,8174	-0,6856	0,6826	-0,6017
Transport	0,9968	0,9308	-0,4837	0,9086	-0,5820
Total	0,9932	0,7737	-0,6657	0,7442	-0,7910

An analysis of the data in Table 6.5 enables us to make the following conclusions. In general, the impact of internal macroeconomic factors on environmental taxes is significant. This means that the stable and satisfactory condition of the domestic European economy has a positive impact on the dynamics of environmental tax revenues, and, consequently, on

the implementation of environmental reforms in the EU. With the growth of GDP, there is an increase in environmental tax revenues to the government budget.

Nominal GDP influences the environmental tax revenues by 99%. The growth of nominal GDP causes the material well-being of taxpayers, which accumulate certain funds to ensure the quality of the environment. The growth of real GDP per capita has a positive effect on the dynamics of environmental tax revenues.

It was revealed, that revenues from environmental taxes are determined by 77% due to the impact of the real GDP per capita. Real GDP (compared to nominal) is less correlated with environmental taxes because of prudent tax policies, which can deter from the rise of inflation.

The impact of inflation on environmental taxes is negative. Revenues from environmental taxes are determined by 66% due to the lowering inflation across the EU. Fighting inflation has a positive impact on the dynamics of environmental tax revenues.

With the reduction of the budget deficit, there is an increase in tax revenues. Revenues from environmental taxes are determined by 74% due to the impact of the budget deficit. As the tax revenues increase, the budget deficit reduces. This dependence indicates the high quality of the fiscal function of environmental taxes.

Energy consumption is declining due to increased environmental taxes. Revenues from environmental taxes are determined by 79% due to the energy consumption.

In general, by manipulating such parameters as real and nominal GDP, as well as the budget deficit, it is possible to increase significantly the effectiveness of environmental tax reforms in the countries of the European Union.

The analysis of external macroeconomic factors is given in Table 6.6.

Table 6.6. Assessment of the impact of external macroeconomic factors on environmental tax policy in the EU countries (authors' calculations based on (Official web-site, 2019)

Tax base	Government debt	Exports	Foreign direct investments
Energy	0,7534	0,9022	0,9962
Pollution	0,5732	0,9441	0,9469
Resources	0,8478	0,6138	0,9296
Transport	0,4259	0,8839	0,9963
Total	0,7086	0,9120	0,9972

As can be seen from the Table 6.6, government debt has a positive effect on the payment of environmental taxes by entrepreneurs. Environmental taxes are a source of paying the debt off. Revenues from environmental taxes are determined by 71% due to the impact of public debt.

The development of export potential has a positive effect on the dynamics of environmental tax revenues. Such dynamics is determined by 91% due to the influence of foreign economic activity. By developing export-oriented business, entrepreneurs contribute to the filling of the budget with environmental taxes.

Foreign investors follow the environmental legislation in the EU countries. Revenues from environmental taxes are determined by 99% due to the impact of foreign direct investments. In general, the openness of the economy helps to recover the business climate and tax awareness of businesses.

The analysis of institutional macro-parameters closely related to the domestic economy of the EU countries is shown in the Table 6.7.

Table 6.7. Assessment of the impact of institutional macroparameters on environmental tax policy in the EU countries (authors' calculations based on (Official web-site, 2019)

Tax base	Ecological culture	Shadow economy	Trust in government
Energy	0,9784	-0,8381	0,1342
Pollution	0,9662	-0,9552	0,1609
Resources	0,7717	-0,0494	0,6035
Transport	0,9614	-0,9336	0,3732
Total	0,9763	-0,8973	0,1754

Interpretation of the data from the Table 6.7 allows us to draw the following conclusions.

The efficiency of the use of physical resources has a direct impact on the dynamics of environmental tax revenues. By paying taxes, entrepreneurs act as beares of ecological culture. Environmental tax revenue is determined by 98% due to the influence of ecological culture. Ecological culture is the highest level of resource protection, which can be achieved, partly, through the strict payment of environmental taxes.

The size of shadow economy has a negative impact on tax policy. The downward trend in shadow economy across the whole EU contributes to the growth of environmental tax revenue. The dynamics of environmental tax revenue is determined by 89% due to the influence of the shadow economy factor. Bringing the economy out of the shadows contributes to the increase in environmental taxes and filling the budget.

In general, trust in government has a positive effect on the economic activity of entrepreneurs. However, given the weak correlation between the analyzed factors, we can conclude that there is a high level of environmental responsibility of businesspersons, which is manifested through the awareness of the need to pay environmental taxes, regardless the degree of trust in political power.

The assessment of fiscal macroparameters in terms of their impact on environmental tax reforms is presented in the Table 6.8.

Table 6.8. Assessment of the impact of fiscal macroparameters on environmental tax policy in the EU countries (authors' calculations based on (Official web-site, 2019)

The statistical observations given in the Table 6.8 enables us to summarize the following statements.

Tax base	Tax culture	Fiscal freedom
Energy	0,8748	0,6939
Pollution	0,9390	0,7130
Resources	0,5575	0,1330
Transport	0,8504	0,5150
Total	0,8837	0,6744

Environmental tax payments by entrepreneurs are a component of the common tax culture in the European Union. Environmental tax revenues are determined by 88% due to the factor of fiscal efficiency of tax management. Based on this, it can be argued that the administration of environmental taxes is effective and provides a high tax culture in the EU.

The positive correlation between the correlates "fiscal freedom - environmental taxes» indicates the heavieness of the latter. Revenues from environmental taxes are determined by 67% due to the influence of fiscal freedom.

The conducted analysis allows us to identify at the macro-level the stimulators (catalysts) and destimulators (inhibitors) of environmental tax policy in the European Union (Table 6.9).

Table 6.9. Catalysts and inhibitors of environmental tax policy in the European Union countries (authors' findings)

Factors	Correlation ration	Catalysts	Inhibitors	Neutral factors
Nominal GDP	+0,9932	+		
Real GDP per capita	+0,7737	+		
Inflation	-0,6657		+	
Government debt	+0,7086			
Budget deficit	+0,7442	+		
Exports	+0,9120	+		
Foreign direct investments	+0,9972	+		
Ecological culture	+0,9763	+		
Tax culture	+0,8837	+		
Shadow economy	-0,8973		+	
Trust in government	+0,1754			+
Energy consumption	-0,7910		+	
Fiscal freedom	+0,6744	+		

The formation of environmental tax policy performance indicators should imply taking into account the assessment of fiscal and reproductive (multiplicative) functions of environmental taxes. For this purpose, we propose in our paper to calculate a multiplicator and accelerator of environmental taxes.

The environmental tax multiplicator is an extra income received by the country as a result of the implementation of

environmental tax reforms. This indicator shows how much GDP will change when the environmental tax changes by 1 euro. If the multiplicator takes a positive value, it tells about a high reproducibility of environmental taxes. If the studied indicator varies within zero or takes a negative value, then this dependence can be interpreted as a manifestation of a purely fiscal function of environmental taxes.

In addition to the multiplicator, it is proposed to calculate in the paper the inverse indicator - the accelerator of environmental taxes. The accelerator of environmental taxes in its economic essence is an indicator of fiscal environmental intensity of GDP.

In addition, we recommend to calculate the elasticity of GDP by environmental taxes, which shows how a change in environmental taxes by 1% causes a corresponding change in GDP. If the coefficient of elasticity is positive and exceeds 1, the environmental tax policy is considered to be effective.

Studies conducted across the European Union, which were based on an analysis of 27 countries, show that the region is relatively effective in performing of environmental tax policy (Table 6.10).

Table 6.10. Analysis of the effectiveness of environmental tax policy in the European Union (Official web-site, 2019)

Indicators	Total	Energy	Pollution	Resources	Transport
Multiplicator	28,77	40,46	3272,38	4517,03	279,06
Accelerator	0,03	0,02	0,0005	0,00015	0,0041
Elasticity, %	0,79	0,74	2,34	0,56	1,36

Progress in improving of the environment quality on a tax basis can be seen mainly in the transport sector. It is transport taxes that demonstrate the highest efficiency in terms of

achieving the macroeconomic effect - the reproduction of the public product, and at the same time the quality of the environment. Other types of environmental taxes perform mainly a fiscal (budget-filling) function.

The development of appropriate tax systems in some European countries is going passively.

The next step of the research study is to analyze the impact of catalysts and inhibitors on the environmental tax multiplicator. We will conduct such an analysis on the example of Germany (Table 6.11-6.12), which demonstrates high rates of sustainable development.

Table 6.11. Factorial analysis results: Germany profile (authors' calculations)

№	Variables	Factor 1	Factor 2
1	Nominal GDP	-0,955937	0,008451
2	Real GDP per capita	-0,944154	0,256266
3	Inflation	0,200506	-0,911429
4	Government debt	-0,258706	-0,617632
5	Exports	-0,834816	0,537843
6	Ecological culture	-0,894180	-0,206397
7	Shadow economy	0,703290	-0,009931
8	Tax culture	-0,727508	-0,649237
9	Fiscal freedom	-0,864892	-0,083361
	Total variance	5,180772	2,038348
	Total share	0,575641	0,226483

Thus, for further study of environmental tax policy in Germany, we choose significant factors № 1,2,5,6,7,8,9.

Table 6.12. Determinants of economic efficiency of environmental taxes: evidence from Germany (authors' findings)

Factor	Regression equation	Economic interpretation
Nominal GDP	y=0,0004x-1061,4	An increase in nominal GDP by 1 euro causes an increase in the environmental tax multiplicator by 0,0004 units
Real GDP	y=0,0518x-1759,9	The growth of real GDP by 1 euro causes an increase in the multiplicator of environmental taxes by 0,0518 units
Exports	y=23,158x-1059,7	Export growth of 1 euro causes an increase in the environmental tax multiplicator by 23,158 units
Ecological culture	y=204,38-486,13	Increasing the productivity of natural resources by 1 unit causes an increase in the multiplicator of environmental taxes by 204,38 units
Shadow economy	y=85,215x-1331,2	An increase in the size of shadow economy by 1 euro leads to an increase in the multiplicator of environmental taxes by 85,215 units
Tax culture	y=91,67x-3641,3	Improving the tax culture by 1 unit contributes to the growth of the multiplicator of environmental taxes by 91,67 units
Fiscal freedom	y=54,95x-3350,6	The growth of fiscal freedom by 1 unit stimulates an increase in the multiplicator of environmental taxes by 54,95 units

Thus, the factors that significantly stimulate the effectiveness of environmental tax policy in Germany are the following: exports (+23 units), ecological culture (+204 units), shadow

economy (+85 units), tax culture (+92 units), fiscal freedom (+55 units).

A wide range of environmental tax instruments and skillful implementation of tax policy leads to a rapid sustainable development in the European Union.

Improving the efficiency of environmental taxation in Ukraine should begin with reconciling the interests of all participants in the environmental taxation system. the waste tax has the best prospects in this direction. The waste tax in Ukraine should be a lever that leads to changes in the behavior of consumers and producers, leads to initiatives aimed at creating cleaner living conditions and improving the environment. Given all the above, it is possible to determine the list of alternative schemes for reforming the environmental tax in Ukraine, which take into account the specifics of payment of waste tax by consumers, as well as the scheme of producer responsibility and the possibility of obtaining benefits:

1. Individuals and legal entities pay a tax on environmental pollution, which includes a share of the tax on garbage that is subject to taxation. Such persons delegate their waste disposal responsibilities to a transport company that represents their interests and whose main responsibility is to deliver the waste to the recycling plant. In turn, legal entities submit periodic reports to state funds on the amount of waste for a certain period. The state, taking into account the types of waste, forms the Regulation "On the treatment of certain types of waste (incineration / disposal / utilization / processing)", as well as provides tax benefits to waste processing plants and subsidies to stimulate their construction and efficient operation in the future.

2. The second alternative differs from the first in that for legal entities there is a need to organize an individual fee for the amount of waste generated and proper waste management. In compliance with the requirements of waste management, such an institution is exempt from tax. Another important step is that

legal entities must directly enter into contracts with waste processing plants and submit consolidated reports on the amount of waste generated and transferred for recycling. As for individuals, their interaction with transport companies remains stable.

3. The third alternative involves joint responsibility, implemented in such a way that legal entities enter into contracts with waste processing plants through an organization with appropriate functions, which, based on periodic reports provided by legal entities, will direct waste to the least loaded plants, in order to reducing the wear rate of processing devices and the efficient operation of each such institution. As for the powers of the government, in such an alternative, the influence is exercised only on the issue of licenses and the determination of the amount of subsidies provided. However, it should be noted that in case of non-compliance with such alternatives, legal entities that are endowed with certain functions - must pay tax revenues to the budget in the form of penalties.

Thus, the final choice of an alternative to reforming the environmental waste tax should be made by the government in terms of the most effective organization of such tax collection.

Since one of the main problems of Ukraine, which hinders the effective organization of the waste management system, is the lack of targeted environmental tax payments, we also propose to adapt the experience of European countries to create a special environmental fund. Note that effective waste management is an expensive process that often requires the involvement of 20% to 50% of municipal budgets. That is why in order to accumulate funds from environmental revenues in Ukraine, there is a need to create an Environmental Fund, whose activities will also consist in the distribution of such revenues in order to address the problems of sustainability of human development and the quality of the environment.

Potential directions of use of the Environmental Fund sources may be:

1) partial or full financing of construction of waste processing plants;

2) development and production of highly environmentally friendly and resource-saving machines for the use of waste as alternative energy sources;

3) creation of powerful nature protection constructions and devices;

4) development of technical methods and means of monitoring the condition of landfills;

5) re-equipment of networks for monitoring the state of the environment and development of the environmental monitoring system;

6) implementation of measures to ensure the secondary use of waste;

7) subsidies to enterprises for reducing the amount of waste generated etc.

Today it is important to assess not only the prospects for the implementation of this Environmental Fund, but also the consequences of such a decision. Proceeds from the environmental tax will be directed to the formation of a separate fund, the main purpose of which is targeted funding by type, which will allow responding quickly to environmental changes and changes in human development.

As the experience of European countries shows, the combination of measures aimed at landfill development and modernization of equipment used for waste collection and transportation allows reducing the cost of construction of new landfills for waste disposal in 10-12 years. That is, using the experience of EU countries in waste management, Ukraine will be able not only to reduce waste, landfills and unauthorized landfills, but also to update the management system and waste taxation policy through its reorganization and harmonization.

An important place in ensuring the effectiveness of the country's environmental tax policy is the creation of a favorable environment for its implementation, which combines not only well-developed tax instruments, but also conditions for mutual control and accountability of all participants in the environmental system. In Ukraine, in contrast to European countries, the levels of ecological and tax culture remain low, while at the same time the level of economic shadowing is high. In addition, the legal regulation of environmental audit and reporting has not been finalized. Therefore, based on the identified problems, several fundamental areas for improving the regulation of environmental activities should be defined:

1. Introduction of obligatory electronic ecological reporting for business entities operating in Ukraine (according to a separate form) the ecological report form might be developed on the basis of the analyzed ecological report in the EU countries, and establishment of responsibility for violation of filling such forms in terms of the amount of emissions and costs incurred to eliminate the damage to the environment.

2. Establishing a clear mechanism for coordination and monitoring of environmental activities of enterprises, through environmental audit and approval at the legislative level of the environmental audit program to avoid further excessive anthropogenic impact on the environment, and consolidate this mechanism at the legislative level by making appropriate changes to current legal acts.

3. Review of the functions, responsibilities and subordination of the Ministry of Ecology, its departments and other authorities in the field of governance at the supranational, state and regional levels. Strengthening the capacity of other central authorities that are responsible for managing the environment and natural resources.

4. Ensuring proper capacity building and training for public authorities on environmental reporting and auditing, taking into

account the principle of sustainable development at the national and regional levels with the involvement of the private sector and civil society.

5. Regulation of subventions and subsidies for waste processing enterprises and those who use equipment that helps to protect the environment. Also a necessary condition is the abolition of income tax for 5-7 years to be able to effectively use the equipment for its intended purpose and reduce the tax burden of the tax, which will encourage entrepreneurs to carry out waste processing business to maximize profits.

Thus, the identified prospects for the development of the environmental tax system of Ukraine, will help raise public awareness of the state of the environment; and improving the environmental safety.

6.2 Economic and tax instruments of information technology and environmental development in the context of providing economic security of the state and ensuring inclusive growth[1]

The modern world is impossible to imagine without information technology (IT). In a relatively short period of time, the sphere has transformed from an ordinary, sometimes secondary industry into one of the main drivers of the world economy. It has become a kind of catalyst for radical changes and transformations in many other industries. The IT industry occupies a prominent place in both the world economy and the economy of Ukraine.

The information and communication technology (ICT) market consists of telecommunications and information technology industries, which can be considered as separate markets. Each of these industries in turn is divided into another ones. Thus, the IT industry includes the following areas: hardware (industrial and server equipment and user equipment); software (hereinafter - Sw) (enterprise software, information security software and open source software); sphere of IT services (outsourcing, IT consulting, as well as processing and storage of electronic information) (Voitko, Sakalosh (2007)).

In 2018, global spending on IT products and services increased by 6.2%, which is higher than global GDP growth. At the same time, the share of export of IT services in total export of services in the world during 2009-2018 increased from 8.7% to 10.5%; the growth rate of the IT industry in terms of market size increased by an average of 17-27% annually.

[1] The publication is carried out under the financial support of the Ministry of Education and Science of Ukraine within the framework of applied research project "Structure-functional multiplicative model of development of the system of environmental taxes in Ukraine in the context of providing national security" (0119U100759).

In addition, the field of information and communication technologies takes the second place in Ukraine in terms of services provided to individuals, businesses and other consumers. In 2019 Ukrainian consumers got IT services in total value of 63 billion UAH, which is almost 7% of the total volume of services provided and 39% of ICT services. Despite the decline in export in the country, the IT industry shows growth of 11-26% annually. In 2017, IT services were on the 3rd place in the structure of the export of services, and in 2018 – on the 2nd and the IT sector formed as much as 4% of the country's GDP (State Statistics Service of Ukraine, 2020).

In 2019, export of services in the field of computer and information services in Ukraine amounted to 2.43 billion US dollars, and imports to 0.496 billion US dollars. Moreover, the percentage of total services increased by almost 16% and 7%, respectively. Comparing to the previous year, export in the field of IT services increased by an average of 20% and import - by 12.5%.

As of the end of 2019, according to the Community of Programmers DOU.UA in Ukraine it was employed about 200 thousand of IT professionals, the number of published vacancies in comparison with previous year increased by 9%, wages also increased on average 300-400 US dollars.

People are the greatest value for IT companies, and therefore one of the key factors for the development of the industry is human capital. IT is an industry of knowledge, expertise, talent, creativity, etc. That is why an important factor is the formation of an "ecosystem" that could ensure the constant interaction of all participants. The IT ecosystem in Ukraine is quite young, but it can be described as dynamic and multifaceted. Such a system includes specialized business associations, innovation parks, regional associations (clusters), professional formal and informal communities, higher education institutions that

develop technical education, and private educational projects, technology hubs, etc. There are currently 17 regional IT clusters in Ukraine. Large and medium-sized companies tend to participate in business associations that are segmented by industry (for example, one association brings together representatives of the service IT industry, and the other focuses on working with investors and start-ups) (Асоціація IT України, 2020).

The Ukrainian market is represented by such IT companies as EPAM, SoftServe, GlobalLogic, Luxoft, Ciklum, NIX Solutions, Infopulse, DataArt, EVOPLAY, Intellias and others. The first two largest, with more than 6,000 specialists, the next 3 - from 2800 to 4100, all other companies in the country - less than 2100 specialists. Such companies as SoftServe, Eleks, Sigma, Miratech were established in Ukraine.

Most companies provide IT services, some work for the parent company, and such as EVO, Genesis, Terrasoft (about 15% of them) create their own product.

For example, Epam has developed a unified platform to support the digital transformation of adaptive enterprises based on artificial intelligence. Also develops Connected Car solutions that provide opportunities for a safer, more comfortable and personalized experience in the car.

Luxoft in Ukraine is working on a solution for the automotive industry - among their projects is a platform for information and entertainment system, which is installed in cars Mercedes-Benz A-Class; create navigation systems, etc. They are also working on complex financial systems for banks, international corporations, etc.

The regional company MindK is working on the development of software as a service, websites and portals, mobile and business applications, etc. They mainly cooperate with foreign clients, but also have orders from domestic enterprises.

Positions in international rankings also speak about the rapid development of the IT industry. Thus, in the Global Services Location Index, Ukraine ranks 20th in 2019, the country has improved its indicators and rose from 24th place compared to 2017, according to the Network Readiness Index also rose from 66 (2018) to 64 (2019) position, according to the Information Society Index and the ICT Development Index from 79 (2016) to 78 (2017) place.

Despite some positive changes, Ukraine still remains at a fairly low position in the rankings, which is not comforting enough. Baker Tilly identified 5 key factors hindering the development of the IT sector in Ukraine, namely: unfavorable business climate (the main problem is that specialists work in the shadows, and the main obstacle is an unfavorable economic climate), underestimation of the importance of the industry, lack of quality education (outdated teaching program), which leads to the following problem - lack of qualified personnel, and the problem of protection of intellectual property rights.

Thus, IT companies are not only important for strengthening the country's competitiveness, but also in ensuring country economic security. That is why the formalization of economic and tax instruments for maintenance of economic security of the state and ensuring inclusive growth is an urgent task.

It is also necessary to highlight that development of IT sector is also closely connected with the country sustainability and environmental friendliness. Namely, development of IT sector allow improving environmental responsibility through the next channels:

- ICTs create a background for implementation of environmentally-friendly technologies;
- ICTs support distance employment thought it allow decreasing greenhouse gas emission;

– ICTs are widely used for forecasting of climate changes environmental damages, and natural disasters;
– ICTs support environmental literacy etc. (ICT and environment, 2011).

Thus, we can conclude that development of ICT sphere allows not just ensure economic growth but also helps to promote environmental responsibility on national, corporate and personal levels.

Numerous national and foreign researches are focused on the identification of economic determinants of the IT sphere development. Some of them also specify importance of the IT sphere development in terms of ensuring economic security.

Meshko and Kostiuchenko (2015) analyzed the IT market of Ukraine, studied its dynamics and state. They concluded that there are prospects for the development of the IT sector in Ukraine, despite the instability of the situation and the risk environment. Correlation and regression analysis revealed that the volume of the IT market in Ukraine is influenced by such factors as the volume of GDP, foreign direct investment, exports of services and average wages.

Sakalosh and Voitko (2007) also concluded that the development of the ICT market is directly proportional to the level of nominal income. Nikitina and Voitko (2018) studied the dynamics of inflation and identified its impact on real export of ICT services. They analyzed the differences between nominal (excluding inflation) and real (adjusted on inflation) values of export of ICT services, using the integrated method. This made it possible to identify patterns and objectively assess the real rate of increase or decrease in export of ICT services. Based on the data obtained, it was found that Ukraine, India and the Russian Federation have a significant value of this indicator. This is due to the high level of inflation in the studied period.

Feliksova (2016) examines the competitiveness of the IT sector of Ukraine in the international perspective. The author researched Ukraine's position in international rankings on the main components of the Network Readiness Index, identified the leading countries, as well as factors that positively and negatively affect the development of the IT sector based on the reports from the World Economic Forum. Thus, it was determined that the development of IT sector is positively influenced by such factors as the literacy rate of the adult population, the percentage of the population with higher and secondary education, the quality of teaching mathematics and science, mobile coverage, mobile phone users, knowledge-intensive jobs, number of patents / applications, etc. In turn, the following factors have a negative impact: independence of the judiciary, the importance and promotion of ICT in public policy, the effectiveness of the legal system, protection of intellectual property rights, total tax rate, the impact of ICT on the creation and development of new products or services, availability of innovative technologies, number of days to start a business, etc. The author also focused attention on the necessity of stimulating the development of such areas as outsourcing of IT services, R&D centers, international development centers and IT clusters, as well as cloud technologies.

Machuga and Borukh (2019) note that the state policy of ICT development should be aimed at developing the competitiveness of ICT goods and services through the formation of national strategy, balancing international and domestic policy, creating of favourable legislative, social, economic atmosphere in the field of information technologies development and use of ICT; improving the quality of domestic goods and services, as well as the need to address the issue of insufficient investment in ICT. The domestic market needs to be developed to reduce dependence on exports.

Brynza and Havrylov (2018, 2019) conducted research based on expert surveys, and also created a generalized multifactor assessment of regions, on the basis of which they formed a rating of regions of Ukraine according to their ICT capacity. The results of this study showed that the IT industry is developing unevenly, due to the geographical location, as well as the quality of graduates' education. They also calculated a comprehensive indicator of the state of the IT sector. A total of 23 criteria were taken, which were divided into three categories: "investment attractiveness", "internal state of IT development", and "salary". Using the correlation and regression analysis, the authors determined that all factors have a significant impact on the integrated indicator of the state of the IT industry and unambiguously determine its state.

Sotnichenko (2012) also identifies internal and external factors of influence on the country turnover. These include factors such as inflation, customer solvency, advertising, infrastructure development, quality, accessibility, customs and tariff restrictions, the shadow economy, membership in international trade organizations and unions, dependence on resources, tax regulation, tariff regulation.

Ganushchak-Yefimenko (2016) determined that the development of entrepreneurship in the IT sphere is influenced by the following factors: the level of taxation, the availability of benefits and privileges for foreign investment in the IT sector (government pressure), brain drain, knowledge of English, uncompetitive salary, lack of qualified educational institutions. The analysis also shows that 80% of companies work in outsourcing, and 20% focus on software production.

At the same time, David Zaha (2018) also notes that ICT enterprises with foreign direct investment show seven times higher labour productivity and four to six times higher overall factor productivity than enterprises without foreign direct

investment. Thus, he concluded that enterprises with foreign investments have a potential to produce a third of GDP.

Consequently, the analysis showed that the development of the IT sector is influenced by a number of social, economic and fiscal factors, but the lack of a unified vision of key drivers and inhibitors of the IT industry in the context of economic security requires further and deeper research. It was determined that for the further research, the turnover of the ICT industry will be the best fitted dependent variable.

ICT turnover is calculated by the formula:

$$y = Es + Is + Eg + Ig, \quad (6.1)$$

where Es - Exports of ICT services (billion USD);
Is - Imports of ICT services (billion USD);
Eg - Exports of ICT goods (billion USD);
Ig - Imports of ICT goods (billion USD).

It was also revealed the following potential factors that might influence ICT turnover:

1) Consumer price index (annual %);
2) Labor tax and contributions (% of commercial profits);
3) Foreign direct investment, net inflows (BoP, billion current US$);
4) Gross fixed capital formation (billion current US$);
5) The income tax rate (%);
6) Shadow economy (% GDP);
7) Taxes on income, profits and capital gains (% of revenue);
8) Profit tax (% of commercial profits);
9) Unemployment, total (% of total labor force) (modeled ILO estimate);
10) Time required to start a business (days);

11) Research and development expenditure (billion current US$);

12) Labor force with advanced education (% of total labor force);

13) Internet users (per 100 people);

14) Percentage of graduates from tertiary education graduating from ICT programmes, both sexes (%);

15) Control of Corruption: Estimate (captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5);

16) Regulatory Quality: Estimate (captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5);

17) Rule of Law: Estimate (captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5);

18) Global cpmpetitiveness index (score);

19) ICT adoption (one of the pillars used in determining the global competitiveness index).

All the above mentioned indicators were collected from the World Development Indictors (2020) of the World Bank collection.

20 countries were selected for the analysis, such as Ukraine, Germany, Romania, Croatia, Belgium, Czech Republic, Poland, Moldova, Hungary, Latvia, Lithuania, Estonia, Slovenia and Italy, Great Britain, Denmark, India, USA, Iceland and China.

The first stage of the study is to check the factor features for multicollinearity, i.e. the existence of a close linear relationship, or correlation, between two or more explanatory variables. It negatively affects quality of the econometric model or makes its construction impossible. We perform this check using the "correlation" function of the Stata software.

Correlation analysis showed that there is still a fairly close relationship between some independent variables. In order to eliminate multicollinearity problem, no independent variables that have strong correlation were included to the regression model.

Thus, the following potential factors were identified for the regression analysis: inflation, consumer prices (% in annual terms); labor tax and contributions (% of commercial income); foreign direct investment (BoP, million USD); income tax rate (%); profit tax (% of commercial income); time required to start a business (number of days); labor force with advanced education (% of the total labor force); percentage of graduates from tertiary education graduating from ICT programmes, men and women (%); regulatory quality (points) and the Global Competitiveness Index (points).

Therefore, after eliminating the problem of multicollinearity, it is advisable to proceed to the next stage – the realization of the regression analysis, the results of which are given in table 6.13.

Analysing the data presented in the table 6.13, we can draw the following conclusions:

– the value of the overall coefficient of determination shows the relationship between the dependent and independent variables; value of the coefficient at 0.794 means that the

relationship between dependent and independent variables is quite significant

Table 6.13. The results of regression analysis based on a model with random effects

Turnover of ICT	Coef.	St.Err.	t-value	p-value
Inflation, consumer prices	1102.74	771.48	1.43	0.153
Labor tax and contributions	-2041.56	654.76	-3.12	0.002
Foreign direct investment	0.26	0.14	1.89	0.059
Income tax rate	5584.07	1159.17	4.82	0.000
Profit tax	6960.29	1045.26	6.66	0.000
Time required to start a business	194.81	461.19	0.42	0.673
Labor force with advanced education	-5742.69	1117.86	-5.14	0.000
Percentage of graduates from tertiary education graduating from ICT programmes	1432.59	2888.08	0.50	0.620
Regulatory quality	82807.33	12333.4	6.71	0.000
GCI	328.69	167.57	1.96	0.050
Constant	298000.0	91445.31	3.26	0.001

Mean dependent var	69147.664	SD dependent var	112915.755
Overall r-squared	0.794	Number of obs	134.000
R-squared within	0.121	R-squared between	0.828

– the meaning of the indicator "t-value" should be more than 1.96; the meaning of the indicator "p-value" should not be more than 0.1 (at 10% confidence level); thus, statistical significance of such independent variables as inflation, consumer prices; the time required to start a business and the

percentage of graduates with higher education who have completed ICT programs is not confirmed as their values are 0.153, 0.673, 0.620, respectively;

– the highest significance have such independent variables as labor tax and contributions; foreign direct investment, net inflow; corporate income tax rate; income tax; labor force with higher education; regulatory quality and Global Competitiveness Index.

Using the calculated coefficients, we can create a regression equation:

$$\begin{aligned} y = 298000.00 &+ 1102.74 \times var4 - 2041.56 \times var5 \\ &+ 0.26 \times var6 + 5584.07 \times var8 \\ &+ 6960.29 \times var11 + 194.81 \times var13 \\ &- 5742.69 \times var15 + 1432.59 \times var17 \\ &+ 82807.33 \times var19 + 328.69 \times var21 \end{aligned} \quad (6.2)$$

where y – turnover of ICT;

var4 – inflation, consumer prices (annual %);

var5 – labor tax and contributions (% of commercial profits);

var6 – foreign direct investment, net inflows (BOP, billion current US$);

var8 – the income tax rate;

var11 – profit tax (% of commercial profits);

var13 – time required to start a business (days);

var15 – labor force with advanced education (% of total labor force);

var17 – percentage of graduates from tertiary education graduating from ICT programmes (%);

var19 – regulatory quality (estimate);

var21 – global competitiveness index (score).

Based on the equation we might underline the following relationships between dependent and independent variables:

– an increase of the consumer price index increases by 1% results in ICT turnover increases by 1102.74 million US dollars;

– an increase of the labor tax and contributions by 1% results in ICT turnover decreases by 2041.56 million US dollars;

– an increase in foreign direct investment by 1 million US dollars results in increase of ICT turnover by 0.26 million US dollars;

– an increase of income tax rate in 1% leads to the ICT turnover increase by 5584.07 million US dollars;

– an increase in profit tax by 1% results in ICT turnover increase by 6960.29 million US dollars;

– an increase in the labor force with advanced education by 1% leads to the decrease of ICT turnover by 5742.69 million US dollars;

– an increase in the percentage of graduates with higher education who have completed information and communication technology programs by 1% results in ICT turnover increases by 1432.59 million US dollars;

– an increase in regulatory quality by 1 point results in ICT turnover increase by 82807.33 million US dollars;

– an increase in the Global Competitiveness Index by 1 point leads to the ICT turnover increase by 328.69 million US dollars.

It is also should be noted that in order to reveal the most relevant drivers and inhibitors of ICT development, it was realized Hausman test. The Hausman test in panel data regression analysis is described as a test for model misspecification. In panel data analysis (the analysis of data over time), the Hausman test can help to choose between fixed effects model or a random effects model. The null hypothesis is that the preferred model is random effects; the alternate hypothesis is

that the model is fixed effects. Essentially, the tests looks to see if there is a correlation between the unique errors and the regressors in the model. The null hypothesis is that there is no correlation between the two (Statistics, 2020). Fixed effects model underlines that country specific influences cohesion between dependent and independent variables, while random effects model states the opposite idea.

The next stage of the study is to test the about the influence of the ICT development on country economic security. Thus, as a proxies of ICT development it was chosen ICT turnover and research and development expenditures, while the Global Competitiveness Index was chosen as an indicator of country economic security. The set of control variables is represented by inflation, GDP, foreign direct investments, gross fixed capital formation, unemployment rate, time required to start a business, number of Internet users, regulatory quality.

The regression analysis results are presented in table. 6.14.

After the panel data regression analysis it was revealed that there is statistically significant relationship between the Global Competitiveness Index and ICT turnover (at 1% confidence level): an increase in ICT turnover by 1 billion US dollars results in the Global Competitiveness Index by 0.001 points. The overall R^2 is 0.835 that allow concluding that variation of the dependent variable in 83.5% explained by the variation of all explanatory variables.

The results of the analysis indicate that the most significant and influential variables for country economic security and competitiveness are such as ICT turnover, gross fixed capital formation, unemployment, Internet users and regulatory quality, as well as less influential but significant factor is such as the time needed to start a business.

Thus, based on the regression analysis it was identified that fiscal determinants have significant influence on ICT

development. Consequently, it also highlight the necessity of tax reform in this sphere in our country.

Table 6.14The results of regression analysis based on a model with random effects

GCI	Coef.	St.Err	t-value	p-value	Sig
Turnover of ICT	0.001	0.000	4.63	0.000	***
Research and development expenditure	0.003	0.002	1.44	0.151	
Inflation, consumer prices	0.000	0.002	0.14	0.890	
GDP	0.000	0.000	-0.48	0.628	
Foreign direct investment	0.000	0.000	-0.78	0.433	
Gross fixed capital formation	0.000	0.000	-3.35	0.001	***
Unemployment	-0.022	0.004	-6.12	0.000	***
Time required to start a business	0.004	0.002	2.14	0.032	**
Internet users	0.005	0.001	4.64	0.000	***
Regulatory quality	0.269	0.055	4.86	0.000	***
Constant	4.069	0.120	33.77	0.000	***
Mean dependent var	4.669		SD dependent var	0.516	
Overall r-squared	0.835		Number of obs	200.000	
R-squared within	0.484		R-squared between	0.859	
*** p<0.01, ** p<0.05, * p<0.1					

It should be noted that the Ministry and the Committee for Digital Transformation of Ukraine in 2019 worked on tax reform for the IT industry and as a result it was proposed to introduce an IT tax on the company's turnover of 4-7%, while abolish corporate income tax, personal income tax and social contribution fees. In the period from 2020 to 2024, it is proposed gradual (1%) increase of the tax, and consequently in 2024 the

tax to be paid will be 7% of revenue. In addition, IT companies in terms of the reform are obliged to pay military fee (1.5%) and social contribution from the volume of two minimal salaries (Реформа, 2019).

The disadvantages of this regime are: increasing the tax burden on the legal entities, the regime is aimed only at exporters, inequality in the payment of social contributions, absence of tax rebates in education, mortgage and others. As a result, this project caused a lot of discussion and dissatisfaction.

Earlier, the Ministry also proposed the creation of a separate fifth group of the simplified scheme of taxation, which introduces payment of the unified tax in 5% of revenue, 1.5% of military fee and social contribution from the volume of two minimal salaries. It was also proposed to introduce an additional tax (progressive: from 1% to 5%) in order to create a "Human Capital Development Fund". The market also did not support this idea.

Another idea is to create a preferential IP-Box mode, using international experience. Under this regime, it is planned to reduce tax rates by 80% (corporate income tax, personal income tax and social contributions. If the costs of development will be gained in Ukraine, the use of intellectual property will bring income and this income can be compared with the costs incurred. This reform might increase the attractiveness of R&D centers, promotion of knowledge-based enterprises, attracting new technologies in Ukraine etc. But such a regime developed by the government is also unattainable in the short term perspective.

As mentioned earlier, the cost of wages in IT companies is 65 - 75%, then there is rent, administrative costs, bonuses for employees, so the profit of the outsourcing company is 7-15%. If taxes will be sharply increased, the company will loss, because no one will order projects in Ukraine more expensive

than, for example, in Belarus, Romania or Poland. If it is increased the tax burden on sole proprietors, they will be forced to emigrate. Budget revenues might initially increase (because projects will have to be completed), but a year or two later the country will lose both specialists and considerable tax revenues.

Thus, it is proposed to reform the system of taxation of personal income tax. As the tax system in Ukraine is not perfect, the reform of some types of taxes entails the reform of others. The modern model of taxation of the IT industry should not contradict the basic principles of taxation defined by the Tax Code of Ukraine, but take into account the interests of all business entities.

Taking into account the government's attempts to reform the industry and the experience of other countries, we concluded that the IT industry in Ukraine should be stimulated through tax optimization, rather than increasing the tax burden on businesses, including sole proprietors.

Since, according to the cluster analysis carried out in the second section, the closest to Ukraine in terms of IT sector development are Hungary, the Czech Republic, Poland, Romania, the Baltic countries (Lithuania, Latvia, Estonia), Moldova, Croatia, Slovenia and Iceland. Thus, we must first pay attention to the experience of these countries. All the proposals are described in table 6.15.

Table 6.15. Proposals for reforming tax legislation in Ukraine in order to promote ICT development

Name	Description of the reform proposal	Benchmark countries
Tax rates	All rates (PIT, CIT, single tax, social contributions) should be introduced in a preferential mode	Hungary, Poland, Romania, the Baltic States, Iceland, Moldova, etc.
Objects of taxation	Clearly define the classification of all objects of intellectual property and IT industry	Hungary, San Marino

Name	Description of the reform proposal	Benchmark countries
Tax calculations	For small and medium-sized enterprises, a deduction of 250% (for targeted R&D expenditures) for the first 5 years, and then 150% for another 5 years ; for large enterprises, first 200%, then for another 5 years 100%.	Romania, Croatia, Slovenia, the Baltic States, China, Hungary, Denmark, Germany, India , Singapore, etc.
IP-Box mode	Reduce income tax on intellectual property to 9% for all businesses Deduction of costs in the amount of 200% of R&D costs by 2025, 100% by 2030.	Poland, Hungary, Cyprus, Spain, Great Britain, Italy, Lithuania, Belgium and others.
	Introduce a tax depending on: – IP object (7-9%) – region (5-9%)	
Technoparks	Preferential income tax rate - 0% - 10% until December 31, 2030 (in order to resume the activities of technology parks in Ukraine) Deduction of 200% (for target R&D costs) by 2025, 100% by 2030 For participants of PIT technology parks - 13%	India, Belarus, Kazakhstan, etc.
Customs payments	Abolish taxes on the import of equipment and components for the IT sector in the customs territory of Ukraine or introduce preferential rates for such goods	India
Grants	Provide financial support in the form of grants for domestic enterprises	Germany, Denmark, USA, etc.

Undoubtedly, the most common way of tax incentives is to establish benefits. In Ukraine, only a preferential VAT rate is applied to software industry products, while it can also be applied to corporate income tax. We offer 10 years in the period

from January 1, 2021 to December 31 2030, the half lower (9%) tax rate on profits of export-oriented enterprises. And also to support the small and medium business of the IT industry: if SMEs have income from export activities more than 70% we propose to reduce the amount of the single tax by half for the same period.

From the experience of India, Belarus, Kazakhstan, it would be appropriate to borrow the creation of technology parks and introduce a preferential tax regime there. As technology parks are already operating in Ukraine, it remains to improve them. For example, introduce a rate of 0% or 10% of the company's profit depending on the product / service sold / provided by December 31, 2030, as well as a deduction of 200% (for target R&D costs) by 2025, 100% by 2030 and for participants of technology parks (PIT taxpayers) - 13%.

First, under the condition of introducing a preferential IP-Box regime, it is necessary to create a regulatory framework for the protection of intellectual property rights based on foreign experience. Clearly understand the classification of objects not only of intellectual property, but also of the whole industry in accordance with international requirements. Such a regime, in turn, can promote the development of domestic food companies.

There is no intellectual property market in Ukraine, because there is no real data on its capacity, the relationship of purchase and sale of patents, the dynamics of supply and demand. This is primarily due to the lack of regulatory framework of the circulation of intellectual property rights, the complexity and duration of such a procedure as the consideration of applications for protection documents. The legislation does not protect the software product, has imperfect mechanisms to combat piracy.

Thus, analyzing the regulations, both domestic and foreign literature sources, analytical reports, we can conclude that the issue of taxation of the industry remains relevant and open.

Along with the issue of taxation of the IT industry, there are other problems that need to be addressed.

One of the problems is the education of specialists. The IT industry is developing rapidly, and universities teach according to the old educational programs. Thus, at the time of release, the material studied is irrelevant. And most graduates have to take courses to get the necessary knowledge that is needed to start working in IT companies.

In Ukraine, the IT industry does not use credit resources. Most loans are provided for short-term periods and at high interest rates, and for long-term periods are almost non-existent. It is necessary to establish a system of lending for IT projects, by introducing low rates for both loans and income tax of commercial banks.

Another problem is that domestic specialists mostly realize their potential by fulfilling foreign orders, thus not creating IT products under the Ukrainian brand. In addition, no less annoying is the migration of personnel. Every year, many professionals migrate abroad in search of a place to realize their potential and a better life.

Another problem is that, despite the fact that Ukraine's IT industry is the second largest exporter of services and plans to increase the share of IT in GDP to 10%, but officially the IT industry is not a priority for Ukraine's economy.

Thus, the current problems of taxation and development of the IT industry were analyzed and suggestions for improvement were developed, taking into account international experience. Thus, the proposed optimization methods can be used both in combination with each other and separately. It is determined that stimulating the IT industry is more rational not

by increasing the tax burden, but on the contrary - by introducing tax benefits, deductions, grants, etc.

During the study of the issue of tax reform in the industry, it was possible to understand that the tax system in Ukraine is imperfect in many of its manifestations. There is a "domino effect": reforming one industry entails reforming another. Based on this and taking into account the specifics of each industry, we believe that it would be fair to set tax rates depending on each industry.

Thus, based on the research we might realize some conclusions. In a relatively short period of time, the field of information technology from a conventional, sometimes secondary industry, has become one of the main drivers of the world economy, becoming a catalyst for tectonic changes and transformations in many other industries. The IT sector is the most mobile sector of the economy, because it does not require large material and financial costs, as engineering, metallurgy, pharmaceuticals and other industries. Its main assets are human capital and well-thought-out marketing policy.

The Ukrainian IT industry is also competitive in the global information services market and is a stable source of foreign exchange earnings, promotes foreign investment, international cooperation, creates new software products and solutions for all other areas of our economy and life, provides new jobs. As the IT industry is developing rapidly and Ukrainian legislation is not keeping pace with rapid growth, there is a need to reform it, namely in terms of taxation, in order to stimulate the industry as one of the leading industries in the country.

Exploring the information technology market in Ukraine, which is developing rapidly and is represented mainly by IT outsourcing, it was also determined that the taxation of the IT industry in Ukraine has its own characteristics in terms of wages, income taxes and value added tax (VAT). In Ukraine, there are

several ways to optimize the tax burden on businesses: building the right model of employment and the application of tax benefits. In particular, the preferential rate applies only to VAT (until 2023, transactions that involve the supply of software products and services provided to a non-resident are exempt from VAT), while other benefits are not available. While international experience shows, other tax incentives can be applied. In particular, such as tax deductions, tax credit, preferential rates, accelerated depreciation of fixed assets used in R&D, grants, as well as the use of the new preferential IP-Box. These incentives can be reconciled with each other.

The identification and assessment of the influence of determinants on the development of the information technology industry revealed that the main key performance indicators of the IT industry development are turnover, research and development costs, ICT development index.

The regression analysis revealed a number of factors that have a significant impact on the dependent variables and formed for each performance indicator of the regression equation.

The analysis of a number of projects of the Ukrainian government and development proposals for the improvement of taxation of the IT industry, and international experience allow came to the conclusion that the IT industry in Ukraine should be stimulated by tax optimization, and not by increasing the tax burden on businesses, including individual entrepreneurs. And this in turn shows the need to reform the tax system of Ukraine as a whole.

In particular, we considered the possibility of introducing the IP-Box regime in Ukraine on the example of Poland, Hungary, Cyprus, Spain, Great Britain, Italy, Lithuania, Belgium with reduced income tax and tax deductions. Also consider the option of restoration works of industrial parks in Ukraine on preferential terms.

Given that the proposed regimes above require significant investment to begin with, we have considered options such as reducing tax rates (some to be waived altogether), introducing tax deductions, preferential rates for the import of equipment and components for the IT sector, grants, etc.

Thus, the proposed optimization methods can be used both in combination with each other and separately. It is determined that stimulating the IT industry is more rational not by increasing the tax burden, but on the contrary - by introducing tax benefits, deductions, grants, etc.

Implementation of the developed proposals in terms of improvement IT companies taxation issues might boost development of IT sphere in our country. This, in turn, will lead to strengthening of country economic security and proliferation of inclusive economic growth. Moreover, development of ICT sector will also positively affected environmental sustainability of the country because it create direct and indirect stimulus for environmental friendliness and responsibility.

6.3 Impact of tax determinants on turist sector of the state in terms of environmental inclusive growth[2]

At the present stage of development, tourism is the main branch of international trade in services. As a category of exports worldwide, tourism holds third place after chemicals, fuel, automotive and food products. In most developing countries, tourism is the most promising and significant category of exports (Rakhmonov, 2018).

In terms of the contribution of tourism to economic, social and environmental progress, its importance is obvious, because according to the World Tourism and Travel Council in 2018, tourism was one of the largest economic sectors in the world, providing 1 in 10 jobs (totally about 319 million people) worldwide and generates 10.4% (8.8 bln. US dollars) of world GDP. Equally important is the fact that the tourism and hotel industry has created 1 in 5 new jobs over the last five years and provided growth in 2018 at 3.9%, while the world economy as a whole - only 3.2% (World Travel & Tourism Council, 2020).

However, despite the presence of a number of positive effects, tourism can be a trigger for environmental crises due to overcrowding or tourist pressure, as well as lead to artificial inflation by raising prices at the level of tourist destinations. Moreover, tourism might have some negative consequences for local communities, including aspects of their quality of life (Dolnicar, Lazarevski, and Yanamandram, 2013).

According to the World Economic Forum conclusions in 2019 Europe became one of the most competitive tourist regions in the world, including 6 of the 10 most attractive countries for

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tourists, namely: Spain, France, Germany, Britain, Italy and Switzerland (Travel & Tourism Competitiveness Index Report, 2019). Europe also has valuable cultural heritage and one of the most developed tourist infrastructure (hotels with the highest density in the world).

Developed infrastructure for business tourism, highly efficient air, road and railway infrastructure create a background for high exports of tourism services, attracting half of international tourism revenues and more than 40% of international revenues (World Economic Forum, 2019).

The key indicators for comparing the competitiveness of countries in the field of tourism include: international tourist arrivals, international tourist revenues, average arrivals, GDP in tourism, the share of industry in GDP, employment in tourism. In Table 6.16 shows the top 10 countries with the best performance in the tourism sector for 2019.

Table 6.16. Top 10 countries with the highest Tourism competitiveness index in 2019 (Travel & Tourism Competitiveness Index Report, 2019)

Country	Tourism competitiveness index	Country	Tourism competitiveness index
Spain	5.4	United Kingdom	5.2
France	5.4	Australia	5.1
Germany	5.4	Italy	5.1
Japan	5.4	Canada	5.1
United States	5.3	Switzerland	5.0

A very important factor in the tourism sector is the ability to resume foreign exchange investment in a very short period. The World Tourism Organization (WTO) estimates, for example,

that a middle-class beach hotel in a developing country will earn all the currency needed to build and equip it in a year. Statistics show that the world's hotel industry consists of 17.2 million rooms, and branded hotels occupy 53% of the market. Leading branded hotel companies, including Marriott, Hilton, Windham and Acor Hotels occupy almost a quarter of the total number of open branded rooms (UNWTO, 2018).

However, not all revenues from tourism remain within the economy. In fact, there is an outflow of currency for some goods and services consumed by tourists, as well as for capital goods invested in tourism and payments abroad. Import needs depend on the level of development and the degree of diversification of the country's economy. These needs also depend on the availability of substitutes for imported products and the quality of the tourist offer in each country.

According to the forecasts (UNWTO, 2018) until 2028 in the sector of travel and tourism may be created 100 million new jobs, 64.5 million of them will be in the Asia-Pacific region, 35 million – in China and 10 million – in India.

Thus, the travel and tourism industry brings significant economic and social benefits worldwide, and has the potential to change people's lives for the better by contributing to economic growth and development, poverty reduction through livelihoods, and tolerance and peace through intercultural exchange and understanding. The sector has shown a strong and steady increase in the number of people traveling abroad each year, as well as its economic impact in recent decades.

Development of the tourism is highly dependent on the taxation issues, so it becomes necessary to analyze both national and foreign experience of tourism enterprises taxation in order to develop a set of recommendations for improvement of tourism taxation system in Ukraine.

Based on the international statistical data analysis, it was revealed that the World Economic Forum (World Economic Forum, 2019) rated the competitiveness of tourism infrastructure in Ukraine in 2019 on 78th place in the list of 140 countries. Also in the structure of domestic GDP, this industry accounts for about 2%, and the average rate for other countries is more than 10% of total income.

Based on the data from the State Statistics Service of Ukraine (2019), the difference between the number of Ukrainian tourists traveling abroad and foreigners traveling to Ukraine is 10 million per year: 15 million foreigners, compared to 26 million Ukrainians.

Table 6.17 shows an example of the average salary of citizens actively traveling in selected countries compared to Ukraine.

Table 6.17. Ranking of countries with the most active tourists in 2018 (Travel & Tourism Competitiveness Index Report, 2019)

№ countries in the ranking	Country	GDP per capita, USD	Average salary, USD
1	Finland	39812	4437.2
2	USA	53042	4695.0
3	Sweden	45148	4751.3
4	Germany	44469	3978.0
5	Norway	65461	6986.2
Ukraine		8790	409.6

We can observe a significant difference between the solvency level of citizens. Thus, domestic tourism for Ukrainians should be more accessible by reducing prices for accommodation and recreation.

The deterioration of the tourist situation in Ukraine occurred sharply in 2014. Thus, according to the State Statistics Service of Ukraine (2019), the number of incoming foreign tourists in 2013 amounted to 232,311 thousand people compared with 17,070 thousand in 2014. This situation also negatively influenced income from international tourism. The dynamics of revenues from the tourist fee in Ukraine for 2011-2019 demonstrates a sharp decrease in revenues in 2014 (24.77 million UAH in comparison to 41.69 million UAH in 2013). In turn, a sharp increase in revenues is observed in 2019 due to the introduced changes in the taxation of the tourism sector in 2019 (Державна казначейська служба України, 2020).

In particular, in 2019 there were introduces amendments to the Art. 268 of the Tax Code of Ukraine (Податковий кодекс України, 2020). Under the implementation of the new rules, the cost of the room and the number of stars in the hotel do not matter and all tourists are in the same conditions. Such a situation negatively affects the economical tourism, because tourists pay the same fee for the most expensive room and hostel. On the other hand, the positive trend is visible, because budget revenues have doubled compared to 2018.

Thus, we can conclude that the tourism potential of Ukraine at the beginning of 2020 has not been sufficiently disclosed, which underlines the necessity of further reforms.

In order to identify the relevant fiscal and economic determinants of tourism sector development it was realized a comprehensive literature review.

In particular, Gooroochurn and Sinclair (2003) identified such peculiarities of fiscal policy frameworks in the context of tourism taxation: it is a reliable source of tax revenue; it might be an effective instrument in correcting production and consumption levels; it can be used to generate revenue intended for specific projects.

According to the International Air Transport Association and the World Economic Forum (2019), one of the main problems with tourism taxation is its negative consequences for the country's competitiveness and the excessive burden on consumers and producers. It is a fair statement that tourists are "over taxed" because they not only bear the burden of targeted taxes, but pay also value-added tax and other taxes on sales of goods during travelling.

However, tourist taxes continue to be popular, although governments tend to regularly reform them to make them more effective.

Seetaram, Song, and Page (2014) found out that consumers' reaction to the taxation of air travel in the UK is insignificant, leading to the conclusion that consumers either increase their budgets to pay taxes or redistribute their costs within their budgets.

Table 6.18 consists of an aggregated information about taxes and fees paid by tourists while traveling.

Table 6.18. Taxes and fees levied in different areas of tourism costs (Study, 2020)

Area of tourist expenses	List of costs
Taxes and fees	–visa fee –taxes at the airport –cost of visa
Commissions	–international travel agent –domestic tour operator –taxes on services –value added tax
International travel	–plane ticket –fuel costs –tariffs –transfer to and from the airport

Area of tourist expenses	List of costs
Domestic travel	–local transport costs –transit fees
Rented housing	–cost of living in the room –hotel taxes –local meetings
Others	–local tours –food and more

Moreover, table 6.19 consists of information on tourist tax in the different countries.

Table 6.19. Characteristics of the practice of paying tourist tax in European countries (European Information and Research Center, 2016)

Country	Payment base	Tax rate / amount	Characteristic
Austria	Per person, per night	€ 0.15 – € 2.18	The amount of tax varies depending on the municipality.
Belgium	Net price per person per night or interest rate per room	€ 0.53 – € 7.50	The amount of tax varies depending on the municipalities
Bulgaria	Per person, per night	€ 0.10 – € 1.53	The amount of tax varies depending on the municipality, and it is paid within the hotel fee
Croatia	Per person, per night	€ 0.27 – € 1.34	The amount of tax varies depending on the municipalities
Czech Republic	Per person, per night	Within € 1.00	Depends on the region
Germany	Percent per person per night or room rate	€ 0.25 – € 7.00 or 6% of the room rate	Taxes vary depending on the type of housing, price and location

Country	Payment base	Tax rate / amount	Characteristic
France	Per person, per night	€ 0.20 – € 4.00	The amount of tax varies depending on the municipality. Municipalities have the right to add 10% of additional state and 15% of additional regional taxes to prices.
Greece	Per person, per night	€ 0.50 – € 4.00	The fee depends on the rating and quality of the hotel.
Hungary	Percentage of room rate	4% of the room rate	Applies to room rate (before VAT added)
Italy	Per person, per night	€ 0.30 – € 7.00	The amount of tax depends on the municipality and the type of housing
Lithuania	Per person, per night	€ 0.30 – € 1.00	The amount of tax depends on the municipality
Malta	Per person, per night	€ 0.50	It has no regional diversity and is used throughout the country.
Netherlands	Percent per person per night or room rate	€ 0.55 – € 8 or up to 7% of the room rate	The amount of tax depends on the municipality
Poland	Per person, per night	€ 0.37 – € 0.55	The amount of tax depends on the municipality
Portugal	Per person, per night	€ 2.00	The amount of tax depends on the municipality
Romania	Percentage of room rate	1%	The amount of tax depends on the municipality
Slovak Republic	Per person, per night	€ 0.50 – € 1.65	The amount of tax depends on the municipality
Spain	Per person, per night	€ 0.25 – € 2.25	Depends on the city or region

Analyzing the information presented in the Table 6.19, it can be noticed that in researched countries tax base of tourist tax depends mostly on the room rate and number of stars of the

hotel. Thus, tourists pay a tax depending on the cost of their trip, which is more rational and fair.

Other taxes are no exception, with VAT rates on residence in the European Union (EU) currently ranging from 3% (Luxembourg) to 25% (Denmark). Member States must apply a standard VAT rate of at least 15%, but be able to apply a reduced rate to hotel accommodation. The United Kingdom is one of the few EU countries that has not benefited from a reduced rate, and only Denmark has a higher VAT rate than the United Kingdom for accommodation. Thus, corporate income tax varies considerably in terms of baseline rates, but comprehensive income tax rates range from 9% (in Hungary) to 35.53% (in Belgium) , and average about 21%. Many of the lowest rates apply in Eastern European countries with rates ranging from 9% to 21%. Marginal personal income tax (PIT) rates for average workers in the EU-28 range from 10% in Bulgaria to 54.5% in Belgium, averaging just under 30% for all member states. Across the European Union, there is a tendency for higher VAT to be associated with higher PIT, and there are very few benefits or special subsidies for the tourism sector (The Impact of Taxes, 2017).

In the research (WTTC, 2018) it was revealed that increasing the tax rate by 1% would lead to reduction of the average contribution of travel and tourism to GDP by 56.7 million USD due to the further decline in the number of visitors. In South Korea, increasing VAT by 1% will reduce the demand of visitors and reduce overall contribution to GDP to 117 million USD.

Also, a study (The Impact of Taxes, 2017) revealed that reduced VAT rate on related to tourism products and services in Ireland resulted in significant increase of activity and employment in the industry. Reducing the VAT rate applied to the tourism sector from 13.5% to 9% increased activity in the

industry by 16% and increased employment by about 10,000 seats.

All of these potential positive effects largely depend on how the tax is paid. As Rinaldi (2014) noted that desired positive consequences based on fairness, efficiency, stability, simplicity and economy of taxation.

Cetin et al. (2017) proved that tourists are willing to pay for investments that could benefit from their experience, having concluded that tax revenues should be directed particularly at tourist infrastructure development, and travel services as well as in activities aimed at increasing the attractiveness of places to travel.

Thus, we can conclude that there is a large number of scientists who have studied the topic of taxation of the tourism industry and a large number of hypotheses have been considered. Undoubtedly, the taxation of the tourism industry is necessary because it is a source of budget revenues.

According to the results of the analysis, tourist revenues are mostly influenced by value added tax and corporate income tax. Namely, the reduced rates of these taxes have a positive effect on the development of the tourism industry in European countries. Also, in most of the analyzed countries it was found that the base of the tourist tax is the cost of hotel accommodation, and not the minimum wage as in Ukraine. The rate ranges from 0.2 to 7 euros per night per person.

Based on the literature review it was developed hypothesis that the net revenues from international tourism (the difference between international tourism receipts and expenditure) might be affected by the following factors:

– inflation, GDP deflator (annual %);

– GDP per capita (current US dollar);

– taxes on income, profit and capital gains (% of income);

– value added tax (% of income);

– income tax (% of income);

– social contribution (% of income);

– personal income tax (% of income).

In order to test the hypothesis of the impact of factors on the net tourism revenues, 8 countries were selected (the practice of tourism taxation in which is described in the first section), namely: Bulgaria, Austria, Germany, Hungary, Latvia, the Czech Republic, Greece and Ukraine.

All data were collected from the World Development Indicators Collection (2020) of the World Band DataBank.

For further research, it is necessary to determine whether there is multicollinearity between the factors. Multicollinearity refers to a situation where two or more explanatory variables in the model of multiple regression are highly correlated.

Elimination of multicollinearity is a mandatory step of modeling, as ignoring this problem can lead to distortion of modeling results. Checking the presence of the problem of multicollinearity is realized in the Stata software with the help of correlation analysis tool. The results are shown in table 6.20.

After analyzing these results we can conclude that all independent variable have low and medium correlation according to the Chaddock scale, which indicates the absence of the multicollinearity problem.

The next stage of the study is regression analysis, which allows determining factors that have the greatest impact on the dependent variable, as well as to clarify the strength and nature of their relationship.

Table 6.20. The results of correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) tour	1.000							
(2) inflat	-0.033	1.000						
(3) gdp	-0.367	-0.406	1.000					
(4) taxrate	-0.194	-0.262	0.842	1.000				
(5) vat	0.396	-0.163	-0.289	-0.168	1.000			
(6) corptax	-0.374	-0.087	0.666	0.825	-0.185	1.000		
(7) socialtax	0.240	0.442	-0.456	-0.355	0.039	-0.023	1.000	
(8) taxinc	0.217	-0.297	0.677	0.699	-0.096	0.327	-0.454	1.000

However, before proceeding regression analysis, it is necessary to establish the specification of the regression model – fixed or random effects model. Fixed effects model explores the relationship between predictor and outcome variables within an entity (country, person, company, etc.). Each entity has its own individual characteristics that may or may not influence the predictor variables. When using fixed effects model we assume that something within the individual may impact or bias the predictor or outcome variables and we need to control for this. This is the rationale behind the assumption of the correlation between entity's error term and predictor variables.

Fixed effects model remove the effect of those time-invariant characteristics so we can assess the net effect of the predictors on the outcome variable. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model.

To decide between fixed or random effects model you can run a Hausman test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. It

basically tests whether the unique errors are correlated with the regressors, the null hypothesis is they are not. Hausman test proved that our sample is better fitted model with random effects. The regression analysis results are given in Table 6.21.

Table 6.21. The results of regression analysis to identify the impact of tax factors on tourism revenues in the studied countries in 2008-2019

Tour	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
inflat	-556.278	175.983	-3.16	0.002	-901.199	-211.357
Gdp	0.808	0.136	5.95	0.000	1.074	0.541
taxrate	449.850	200.195	2.25	0.025	57.476	842.225
Vat	1272.445	453.722	2.80	0.005	383.167	2161.724
corptax	-1101.44	369.886	-2.98	0.003	-1826.40	-376.482
socialtax	869.018	146.558	5.93	0.000	581.770	1156.265
taxinc	2587.306	369.002	7.01	0.000	1864.076	3310.537
Mean dependent var	-1376.592		SD dependent var		16258.177	
Overall r-squared	0.711		Number of obs		96.000	
R-squared within	0.032		R-squared between		0.873	

Based on the regression analysis it can be noted that the coefficient of determination in regression model is rather high – 0.711, that allow concluding countries that the seven independent variables included into a model and capable explained 71.1% of variation of the dependent variable.

The obtained results allow us to draw the following conclusions: an increase of inflation in 1% leads to the decrease of net international tourism receipts by 556 million US Dollars (1% confidence level), as tourists do not choose a country with high inflation for their travel, because it increases their own costs in this country.

On the contrary, when a country has a high GDP per capita, the interest of tourists is higher to this country, because usually well-developed countries have high GDP. This statement proves the regression analysis: with an increase in GDP per capita by $ 1,000 US Dollars revenues from tourism increase by 808 thousand US dollars.

It also should be noted that with increase of the tax on profits (corptax) by 1%, net revenues from tourism reduced to 1101 mln USD (at 99% confidence interval). While an increase of tax on personal income (taxrate) in 1%, results in increase of net revenues from tourism in almost 450 mln USD. This is due to the fact that when increasing the personal income tax, the state budget will be replenished with revenues from jobs created by tourism.

It is also can be noted an increase in tourist revenues by 1272 million US dollars under the increase of the rate of value added tax (vat) by 1%. This is explained by the fact that while purchasing of goods and services tourists are paying indirect taxes, which increases the amount of revenue from the tourism industry. A similar situation occurs with the social contribution: with an increase in the rate by 1%, the country receives additional 869 million USD of revenues from tourism due to the creation of new jobs, for which employers are required to pay social contributions.

Based on the empirical research results, it can be concluded that many socio-economic factors have an impact on tourism revenues. In particular, the choice of country for tourism is influenced by such factors as inflation and GDP growth. It is also proven that such taxes as: taxes on income, profit and capital gains (% of income), personal income tax (% of income), value added tax and social contributions have a significant impact on the tourism sector as a whole. Studies have shown that

a number of important parameters affect revenues in European countries, and can be used by the authorities in their practice.

Summarizing of the previous sections of the work allows noting that the tourism fee is a fiscal payment, the legislative regulation and legal mechanism of which has undergone a major transformation in late 2018. The main direction of the change was the rate and base of tax collection. Analyzing foreign experience and the experience of previous years, we can recognize the reforms as negative. The first and most important change was the change in the tax base: from the cost of living, it was changed to the minimum wage. Such a radical transformation, primarily affected the economy tourism, as all tourists, regardless of the cost of living, have to pay the same fee. Today, the tourist fee is up to 0.5% of the minimum wage for domestic tourism and up to 5% – for inbound tourism.

Another change was the distinction payment of the fee for the residents and foreigners. Based on the analysis of foreign experience in collecting tourist tax, we can mention that European countries set the rate depending on the cost of living, without dividing tourists into residents and foreigners. In fact, for a foreign tourist who decides to visit Ukraine, the price can increase by 50-80%. However, domestic tourists who go on business trips continue exempt from the tourist fee collection, while foreigners in the trip must pay it.

The analyzed innovations can lead to destructive phenomena in the development of the domestic tourism sector. There is a risk of job cuts of about 25%; intensification of the shadow sector and, as a consequence, reduction of the tax base; closure of small accommodation establishments and drop in the number of jobs in the hotel sector. In addition, the probable consequence may be the deterioration of the international image in Ukraine due to discrimination against foreign tourists and business

travelers, as well as reducing the flow of foreign tourists to Ukraine (Romanova, 2019).

According to a preliminary analysis, the main income from tourists comes from indirect taxation. That is, when a tourist spends money on services and increases the income of taxes such as value-added tax and excise duty. In addition, foreign experience shows that for the development of the domestic tourism sector it is necessary to reduce the tax burden on the cost of accommodation.

Systematizing the results of the analysis, we note that in order to bring the contribution of the tourism industry to the development of the domestic economy to European indicators, it is necessary that one of the strategic goals of both the state and regions is tourism attractiveness, which would aim to increase tourism efficiency.

Thus, taxation is a tool to increase the competitiveness of enterprises in the field of tourism. It should be noted that the tourism industry is not limited to tourism organizations - it includes a range of service companies. Therefore, providing them with tax benefits will affect tourism organizations (Papp, Boshot, 2019).

It should be noted that a significant tax burden has a detrimental effect on the development of the hotel business in Ukraine. To improve the working conditions of the hotel services market, it is advisable to implement foreign experience in domestic practice, which is aimed at reducing taxes to be paid by owners of hotels and other accommodation facilities. In Europe, there is a tendency to reduce value added tax for hotels.

Most European countries implemented low VAT rates for placement of tourists and business oriented to meet travel requirements, because one of the proposals is to implement reduced the VAT rate in Ukraine ranges from 9% to 15%, based

on the experience of countries such as Bulgaria - 9%, the Czech Republic - 15%, Germany - 7%, Greece - 13%, Lithuania - 9%.

Proposals to improve taxation of tourism industry in Ukraine taking into account international experience are systematized in Table 6.22.

Table 6.22.Proposals for improving the system of taxation of the tourism sector in Ukraine

Sphere of improve-ment	Offer	List of countries whose experience is used
VAT rate for tourism - ori ented enterprises	Gradually reduce the rate from 20% to 9% (decreasing by 1% annually)	Bulgaria, Czech Republic, Germany, Greece
Tourist tax payers	Remove the distinction between foreign and domestic tourism	Austria, France, Italy
Tax collection base	Change tax base collection from the minimum wage to the percentage of the value of accommodation counting on one person per night, depending on the number of stars in hotel	Greece, Hungary, Lithuania, Germany, Poland, Portugal
Sphere of improve-ment	Offer	List of countries whose experience is used
Target direction	The funds raised from the tourist tax should be fully used to improve the tourist infrastructure and quality of tourism in Ukraine. Detailed reports should be published annually on the results of their use.	France, Bulgaria , Germany , Italy
Tourist tax collection rate	Set a rate of 3 to 6% of the room rate, at the discretion of local governments	Germany, the Netherlands, Hungary

Income tax rate for tourism enterprises	Gradually reduce the income tax rate from 18% to 10% for tourism enterprises (annually reducing by 1%)	Poland, Croatia

The proposed innovations are based on the experience of European countries that are more developed in the economic and tourism spheres. The above proposals will attract investment to the tourism sector of Ukraine; bring it to a new level, which, in turn, will help improve macroeconomic indicators. Reducing the tax burden will help Ukraine to invest in tourism development and improve the quality of tourism infrastructure. This practice exists in all European countries, should be applied when the tourism sector is low, and does not bring enough revenue to the budget. In addition, lower prices will enhance the competitiveness of countries and increase internal and external tourism.

Reducing the VAT rate and income tax for tourism businesses will reduce the tax burden on the tourism business and thus reduce prices for travelers. Also, such a policy is aimed at encouraging investors to invest in Ukrainian tourism, which has been implemented in neighboring countries, such as Bulgaria, the Czech Republic, Germany, Greece, Poland, Croatia.

The main proposed changes concern to the tourist tax and the system of its collecting. In our opinion, the rate and base of collection should be changed and brought closer to the system of European countries. Tourist tax should be based on the cost of living, not on the minimum wage. In addition, the rate should not vary for Ukrainian citizens and foreigners, as this is a discriminatory policy.

No less important is the targeted direction of the collected tax revenue usage. Revenues from the tourist fee should go to

improve the quality of tourism in the country (such a policy is used in countries such as France, Bulgaria, Italy and Germany), which once again proves its effectiveness.

Taxation of the tourism sector is very important for receiving revenues to the country's budget, but no less important is the quality of tourism in Ukraine and its popularity and accessibility among foreigners. Increasing Ukraine's popularity in the field of tourism is necessary, as it is one of the country's strategic goals.

One of the areas of improvement is to improve the information field. Budgeting marketing and advertising in social networks and on global TV channels to promote interest to our country. Organization of press tours and info tours for representatives of media and tourism business of other countries. For example, according to Georgy Bregadze, head of the research and planning department of Georgia's National Tourism Administration, Georgia organized about 160 press tours last year, while Ukraine organized none.

In order to popularize Ukraine in the world, it will be necessary to hold mass cultural, business, sports and tourist events of international and interregional level. Foreigners visit the country on their own and pay even more taxes and fees when traveling on their own.

Transport connection and its quality is another area of improvement. It is important for tourists to travel quickly and comfortably, so it is necessary to invest in improving the quality of roads and logistics and transport connections between cities and between countries, including air services.

The quality of tourist service and quality control in hotels, restaurants and other tourist enterprises needs to be improved. In Ukraine there are no modern training programs for the tourism sector representatives, which reduces its attractiveness among tourists.

Common tools to stimulate the development of tourism in the world are:

– the provision of direct financial support,
– providing lending on favorable terms,
– the lease of land for the construction of hotel complexes for a long time for a nominal fee,
– tax incentives.

Also among necessary objectives for tourism development might be as follows:

– preservation and rational use of valuable recreational landscapes, resort factors, authentic ecosystems, preservation of cultural and historical monuments, etc.;
– formation of the tourism sector as a highly profitable sector of the Ukrainian economy, to attract national and foreign investment in the development of the tourism industry, the creation of new jobs;
– regulating the availability of tourism and excursions for children, youth, and elders, the disabled and low-income citizens by introducing discounts for these categories of persons;
– development of new recreational and resort areas and territories that have tourist potential, and develop new excursion routes taking into account the historical and cultural values of the region.

Thus, the tasks can be solved only with the help of national policy aimed at the development of tourism as one of the components of the national economy. It is necessary to implement a set of measures aimed at the development of tourism business and Ukraine's entry into the international market of tourism services, it will directly include such elements as the creation of trust funds, subsidies, tourism development programs and more.

Based on the realized theoretical and empirical research results, it might be concluded that taxation plays an important role in the development of the country's tourism sector and brings high revenues to the budget. The analysis of domestic and world experience allowed to distinguish both positive and negative features of taxation of tourism enterprises in Ukraine and the world.

In particular, in the member states of the European Union, tourism today provides about 10% of gross domestic product, while the tourism industry in the structure of Ukraine's GDP is estimated from 1% to 5%.

Thus, it was determined that the system of payment of tourist fee in Ukraine differs from European countries, but with the change of payment rates in 2019, revenues to the state budget have doubled. The negative aspect of innovation lies in the system of payments and collection because the rate is the same for all types of hotels and places of accommodation, that is discriminatory for economy tourism, which is one of the most popular in a country.

Thus, based on the analysis of the literature, the following were found: tourists and the tourism industry in general are excessively taxed, because in addition to targeted taxes, they pay value added tax, income tax, personal income tax, and benefits and subsidies are not provided in Ukraine. The analysis also revealed that understated VAT and personal income tax rates had a positive impact on the tourism sector and revenues from it.

Therefore, it was selected such tax factors to the model as value added tax, personal income tax, corporate income tax and social contributions and such control variables as GDP, inflation, as these factors were included in the research of foreign scholars and had a significant impact on the performance indicators of tourism business.

In order to formalize the relevant factors influencing the development of the tourism sector, a correlation and regression analysis was performed. It involved identification the impact on net revenues from international tourism (the difference between international tourism revenues and expenditures) such 7 independent variables as taxes on income, profits and capital gains, % of income; inflation; GDP per capita (current US dollar); personal income tax (% of income); value added tax (% of income); income tax (% of income); social contribution (% of income). The information base of the empirical study was constructed based on the statistics generated by the 2008-2019 for such countries as Bulgaria, Austria, Germany, Hungary, Latvia, the Czech Republic, Greece and Ukraine. Correlation analysis realized in order to reveal multicollinearity problem allow underlining absence of the problem.

Panel data regression analysis (random effects model specification) showed the existence of connection between income from tourism and the payment of income tax, value added tax and social contributions, so the identified patterns should be analyzed and implemented by the executive authorities under the tax reform in Ukraine.

Based on the study it was suggested a number of proposals in order to improve the quality and efficiency of the tourism industry in Ukraine. The most urgent task is to improve the taxation system of the tourism business. It is proposed to change the base for alloying the tourist tax from the minimum wage to the cost of living in a place to spend the night. Also change the tax rate by 3-6%, according to the decision of the city council, and remove the delimitation of the rate for domestic and foreign tourists. Equally important is the introduction of a number of tax benefits for the development of tourism in the country and the targeted use of funds received for the tourism industry.

A necessary duty of the state is marketing and advertising strategy to disseminate tourist information about Ukraine among the world media. Improving the quality of communication between cities and countries, the service of tourism, and the development and preservation of new recreational areas and areas will attract more both domestic and foreign tourists.

Thus, business taxation plays an equally important role in the development of tourism, as it largely determines the motives of consumers of tourism services, as well as affects the business interests of tourism businesses.

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APPENDIX A

Table A.1. Results of the regression analysis regarding the identification of the impact made by qualitative features of the state regulation on the economic development parameters

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,114	0,835	2,53	0,011
Cons	-3,219	1,077	-2,99	0,003
Result variable: GDP deflator				
RegQ	6,211	39,345	0,16	0,875
Cons	166,187	50,025	3,32	0,001
Result variable: GDP growth				
RegQ	1,674	0,295	5,67	0,000
Cons	4,327	0,346	12,50	0,000
Result variable: GDP per capita				
RegQ	8867,608	1376,090	6,44	0,000
Cons	17458,920	2201,265	7,93	0,000
Result variable: total expenditure for government final consumption to GDP				
RegQ	1,176	0,341	3,45	0,001
Cons	17,693	0,583	30,36	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	1,181	0,576	2,05	0,040
Cons	25,051	0,715	35,03	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	-0,782	3,209	-0,24	0,808
Cons	98,997	5,905	16,76	0,000
Result variable: total reserves in months of imports				
RegQ	-0,457	0,288	-1,58	0,113
Cons	3,647	0,426	8,56	0,000
Result variable: total reserves				
RegQ	5,92e+09	0,62e+09	0,62	0,538
Cons	4,00e+10	1,40e+10	2,86	0,004
Result variable: exports of goods and services				
RegQ	-2,61e+09	2,02e+10	-0,13	0,987
Cons	1,90e+11	4,39e+10	4,33	0,000
Result variable: import of goods and services				
RegQ	-3,65e+09	1,83e+10	-0,20	0,842
Cons	1,79e+11	4,03e+10	4,45	0,000
Result variable: employment				
RegQ	0,843	0,477	1,77	0,077
Cons	47,074	1,345	34,99	0,000

Note: RegQ is an integral index of the quality of state regulation of the economy; Cons is a constant

Source: author's investigation

Table A.2. Results of the regression analysis on revealing the effect made by qualitative features of state regulation of the economy on the country's economic development parameters (lag - 1 year)

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,141	0,860	2,49	0,013
Cons	-3,206	1,104	-2,90	0,004
Result variable: current account balance in relation to GDP				
RegQ	-11,416	41,511	-0,28	0,783
Cons	184,877	52,762	3,50	0,000
Result variable: GDP growth				
RegQ	-1,643	0,296	-5,56	0,000
Cons	4,219	0,347	12,17	0,000
Result variable: GDP per capita				
RegQ	8513,165	1303,400	6,53	0,000
Cons	18476,730	2228,195	8,29	0,000
Result variable: total government expenditure of final consumption relative to GDP				
RegQ	1,132	0,347	3,27	0,001
Cons	17,749	0,581	30,50	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	-1,511	0,579	-2,61	0,009
Cons	25,332	0,714	35,50	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	-2,247	3,246	-0,69	0,489
Cons	100,831	5,996	16,82	0,000
Result variable: Total reserves in months of imports				
RegQ	-0,641	0,296	-2,16	0,031
Cons	3,778	0,437	8,65	0,000
Result variable: total reserves				
RegQ	9,91e+08	1,00e+10	0,10	0,921
Cons	4,55e+10	1,47e+10	3,09	0,002
Result variable: exports of goods and services				
RegQ	-7,52e+09	1,90e+10	-0,40	0,692
Cons	2,01e+11	4,51e+10	4,46	0,000
Result variable: Import of goods and services				
RegQ	-4,71e+09	1,71e+10	-0,27	0,783
Cons	1,87e+11	4,13e+10	4,52	0,000
Result variable: employment of the population				
RegQ	1,079	0,473	2,28	0,023
Cons	46,968	1,348	34,85	0,000

Source: formed by the authors

Table A.3. The results of the regression analysis to reveal the influence of qualitative features of state regulation on the country's economic development parameters (lag - 2 years)

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,173	0,889	2,44	0,015
Cons	-3,144	1,143	-2,75	0,006
Result variable: GDP deflator				
RegQ	-37,952	43,827	-0,87	0,387
Cons	210,263	55,609	3,78	0,000
Result variable: GDP growth				
RegQ	-1,462	0,297	-4,92	0,000
Cons	3,947	0,348	11,33	0,000
Result variable: GDP per capita				
RegQ	7681,386	1265,895	6,07	0,000
Cons	19726,040	2269,253	8,69	0,000
Result variable: total government expenditure of final consumption relative to GDP				
RegQ	0,642	0,352	1,83	0,068
Cons	18,111	0,585	30,95	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	-1,561	0,577	-2,71	0,007
Cons	25,342	0,707	35,84	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	-1,601	3,226	-0,50	0,620
Cons	101,204	6,088	16,62	0,000
Result variable: Total reserves in months of imports				
RegQ	-0,688	0,306	-2,25	0,024
Cons	3,816	0,448	8,51	0,000
Result variable: total reserves				
RegQ	-4,84e+08	1,04e+10	-0,05	0,963
Cons	4,86e+10	1,55e+10	3,14	0,002
Result variable: exports of goods and services				
RegQ	-1,71e+10	1,77e+10	-0,97	0,333
Cons	2,14e+11	4,61e+10	4,64	0,000
Result variable: Import of goods and services				
RegQ	-7,88e+09	1,60e+10	-0,49	0,622
Cons	1,95e+11	4,22e+10	4,62	0,000
Result variable: employment of the population				
RegQ	1,624	0,482	3,37	0,001
Cons	46,651	1,352	34,49	0,000

Source: formed by the authors

Table A.4. The results of the regression analysis on revealing the influence made by the qualitative features of the state regulation on the country's economic development parameters (lag - 3 years)

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,043	0,921	2,22	0,027
Cons	-2,940	1,194	-2,46	0,014
Result variable: GDP deflator				
RegQ	-73,226	46,496	-1,57	0,115
Cons	242,133	58,742	4,12	0,000
Result variable: GDP growth				
RegQ	-1,350	0,309	-4,36	0,000
Cons	3,613	0,363	9,94	0,000
Result variable: GDP per capita				
RegQ	7820,145	1274,721	6,13	0,000
Cons	20151,360	2312,081	8,72	0,000
Result variable: total government expenditure of final consumption relative to GDP				
RegQ	0,242	0,369	0,66	0,511
Cons	18,431	0,599	30,77	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	-1,335	0,582	-2,30	0,022
Cons	25,054	0,711	35,23	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	0,372	3,277	0,11	0,910
Cons	100,424	6,191	16,22	0,000
Result variable: Total reserves in months of imports				
RegQ	-0,723	0,321	-2,25	0,025
Cons	3,860	0,460	8,38	0,000
Result variable: total reserves				
RegQ	-3,90e+09	1,10e+10	-0,35	0,723
Cons	5,32e+10	1,63e+10	3,26	0,001
Result variable: exports of goods and services				
RegQ	-1,48e+10	1,71e+10	-0,86	0,388
Cons	2,18e+11	4,71e+10	4,63	0,000
Result variable: Import of goods and services				
RegQ	-1,62e+09	1,54e+10	-0,11	0,916
Cons	1,95e+11	4,22e+10	4,54	0,000
Result variable: employment of the population				
RegQ	2,088	0,499	4,19	0,000
Cons	46,416	1,359	34,15	0,000

Source: formed by the authors

Table A.5. The results of the regression analysis on revealing the influence made by the qualitative features of the state regulation of the

economy on the country's economic development parameters (lag - 4 years)

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,020	0,938	2,15	0,031
Cons	-2,847	1,208	-2,36	0,018
Result variable: GDP deflator				
RegQ	-92,580	46,308	-1,88	0,060
Cons	263,046	62,518	4,21	0,000
Result variable: GDP growth				
RegQ	-1,180	0,289	-4,09	0,000
Cons	3,210	0,339	9,47	0,000
Result variable: GDP per capita				
RegQ	8119,002	1247,354	6,51	0,000
Cons	20400,130	2333,590	8,74	0,000
Result variable: total government expenditure of final consumption relative to GDP				
RegQ	0,089	0,378	0,24	0,814
Cons	18,577	0,611	30,39	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	-1,088	0,587	-1,86	0,064
Cons	24,704	0,716	34,48	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	2,495	3,323	0,75	0,453
Cons	99,560	6,288	15,83	0,000
Result variable: Total reserves in months of imports				
RegQ	-0,923	0,330	-2,80	0,005
Cons	4,048	0,473	8,56	0,000
Result variable: total reserves				
RegQ	-3,40e+09	1,13e+10	-0,30	0,763
Cons	5,52e+10	1,71e+10	3,22	0,001
Result variable: exports of goods and services				
RegQ	7,77e+08	1,57e+10	0,05	0,960
Cons	2,12e+11	4,78e+10	4,44	0,000
Result variable: Import of goods and services				
RegQ	1,66e+10	1,40e+10	1,18	0,236
Cons	1,87e+11	4,35e+10	4,30	0,000
Result variable: employment of the population				
RegQ	2,317	0,498	4,65	0,000
Cons	46,334	1,360	34,07	0,000

Source: formed by the authors

Table A.6. The results of the regression analysis on revealing the influence made by the qualitative features of the state regulation of the economy on the country's economic development parameters (lag - 5 years)

Variable	Coefficient	Standard error	T	P>|t|
Result variable: current account balance in relation to GDP				
RegQ	2,317	0,921	2,52	0,012
Cons	-2,877	1,175	-2,45	0,014
Result variable: GDP deflator				
RegQ	-122,058	52,510	-2,32	0,020
Cons	291,846	66,834	4,37	0,000
Result variable: GDP growth				
RegQ	-1,068	0,278	-3,84	0,000
Cons	2,694	0,328	8,22	0,000
Result variable: GDP per capita				
RegQ	6896,518	1280,265	5,39	0,000
Cons	21657,380	2400,381	9,02	0,000
Result variable: total government expenditure of final consumption relative to GDP				
RegQ	0,046	0,391	0,12	0,907
Cons	18,666	0,621	30,08	0,000
Result variable: gross capital formation in relation to GDP				
RegQ	-1,211	0,583	-2,08	0,038
Cons	24,448	0,713	34,28	0,000
Result variable: the ratio of total exports and imports to GDP				
RegQ	1,349	3,502	0,39	0,700
Cons	100,819	6,418	15,71	0,000
Result variable: Total reserves in months of imports				
RegQ	-0,727	0,342	-2,13	0,033
Cons	3,940	0,486	8,12	0,000
Result variable: total reserves				
RegQ	-2,16e+09	1,16e+10	-0,19	0,852
Cons	5,66e+10	1,79e+10	3,16	0,002
Result variable: exports of goods and services				
RegQ	-2,86e+09	1,50e+10	-0,19	0,849
Cons	2,19e+11	4,85e+10	4,51	0,000
Result variable: Import of goods and services				
RegQ	1,62e+10	1,36e+10	1,19	0,235
Cons	1,91e+11	4,41e+10	4,33	0,000
Result variable: employment of the population				
RegQ	2,247	0,519	4,33	0,000
Cons	46,421	1,365	34,00	0,000

Source: formed by the authors

Table A.7. Comparison of the social indices composition in different approaches

Social indices	Organizations that report by social indices				
	The approach of the NY Office	Approach of OECD	The approach of the Ministry of Social Development of NZ	The approach of the International Institute for Social Research	The approach of The Social Progress Imperative
Fertility		+	+		
Marital status		+	+		
Employment		+	+		
Unemployment	+	+	+		
Uneven distribution of income	+	+	+		
Poverty	+	+	+		
Lifetime		+	+		+
Own health assessment		+	+		
Suicide		+	+		+
Health care costs	+	+			
Tolerance		+			+
Security		+		+	+
Helping others		+		+	
Psychological danger	+		+		
Primary education level	+		+		+
Literacy of adults			+		+
Affordable housing			+		+
Voting	+		+		
Share of women in government	+		+	+	
Discrimination			+	+	+
The perception of diversity			+	+	
Corruption			+		+
Cultural and social activity	+		+	+	
Crime rate	+	+	+	+	+
Fear of crime			+	+	+
Road accidents	+		+	+	+
Household access to telephone and internet	+		+	+	+
Volunteer work		+	+	+	
Premature mortality	+				+
Infant mortality rate	+				+

Source: formed by the authors

Table A.8. Peculiarities of indices for assessing the social status of Ukraine

Direction of evaluation	Social indices	The statistic information source
Demographic status of the population	Fertility level	WB Development World Database
	The difference between the number of marriages and divorces per 1,000 people	State Statistics Service of Ukraine Database on Demographic and Social Statistics
The economic condition of the population	Total unemployment rate,%	WB Development World Database
	Ginny Index	World Bank's Poverty and Equality Database
	Percentage of population living below the national poverty line,%	World Bank's Poverty and Equality Database
	Share of Internet users in relation to total population,%	WB Development World Database
Trust in institutions	Voting and Accountability	WB Governance Indicators Database
	World Corruption Perceptions Index	Transparency International statistics
Gender equality	Share of women's participation in national parliament,%	World Bank's Gender Statistics Database
Social connections and social activity	Percentage of population helping others, %	Data from the World Giving Index rating calculated by the Foundation for Charitable Aid
	Volunteer share of population,%	Data from the World Giving Index rating calculated by the Foundation for Charitable Aid
	Participation in POs per 1,000 people	State Statistics Service of Ukraine Database on Demographic and Social Statistics
Security	The crime rate, the number of offences per 1 thousand people	State Statistics Service of Ukraine Database on Demographic and Social Statistics
	Number of traffic accidents per 1,000 people	Statistics of the Traffic Safety Administration of Ukraine
Education	Average level of secondary education,%	WB Education Statistics Database
	Percentage of children not receiving primary education,% to the total number of children of the relevant school age	WB Education Statistics Database
Health and psychological status	Life expectancy in years	World Bank's Health, Nutrition and Population Database
	Infant mortality rate, in thousands of children under 5 years	World Bank's Health, Nutrition and Population Database
	The level of public funding for health care,% of public expenditure in general spending	World Bank's Health, Nutrition and Population Database

Source: formed by the authors

Table A.9. Indices for assessing the social status of Ukraine for the period 2010-2016

Social indices	Year						
	2010	2011	2012	2013	2014	2015	2016
	1,44	1,46	1,53	1,51	1,50	1,51	1,53
The difference between the number of marriages and divorces per 1,000 people	4,00	3,80	2,40	3,10	3,90	4,50	4,54
Total unemployment rate, %	8,10	7,90	7,50	7,20	9,30	9,10	9,20
Ginny Index	24,80	24,50	24,70	24,50	24,10	25,50	24,09
Percentage of population living below the national poverty line, %	8,60	7,80	9,00	8,30	8,60	6,40	3,80
Share of Internet users in relation to the total population, %	23,30	28,71	35,27	40,95	46,24	48,88	52,48
Voting and Accountability	-0,08	-0,13	-0,28	-0,32	-0,14	-0,09	0,02
World Corruption Perceptions Index	24,00	27,00	26,00	25,00	26,00	27,00	29,00
Share of women's participation in national parliament, %	8,00	8,00	9,40	9,40	11,70	12,10	12,00
Percentage of population helping others,%	19,00	37,00	36,00	36,00	35,00	35,00	36,00
Volunteer share of population, %	14,00	30,00	20,00	29,00	26,00	13,00	16,00
Participation in NGOs, number of NGOs per 1,000 people	655,34	819,27	794,68	778,43	594,56	598,21	571,51
The crime rate, the number of offenses per 1 thousand people	11,00	11,36	9,80	12,37	11,65	13,17	13,86
Number of traffic accidents per 1,000 people	4,44	4,07	4,30	4,19	3,37	3,13	3,71
Average level of secondary education,%	88,61	88,84	89,45	91,40	93,08	93,07	93,94
Percentage of children not receiving primary education,% to the total number of children of the relevant school age	5,59	1,49	0,92	0,98	3,48	3,23	3,83
Life expectancy in years	70,27	70,81	70,94	71,16	71,19	71,19	71,19
Infant mortality rate, in thousands of children under 5 years	11,70	11,20	10,70	10,20	9,80	9,40	9,10
The level of public funding for health care,% of public expenditure in general spending	56,63	53,40	55,23	54,14	50,79	56,08	56,12

Table A.10. Normalized indices for assessment of social status in Ukraine during 2010-2016

Social indices	Dire-ction*	Year						
		2010	2011	2012	2013	2014	2015	2016
Fertility level	S	0,00	0,18	1,00	0,71	0,62	0,71	1,00
The difference between the number of marriages and divorces per 1,000 people	S	0,75	0,65	0,00	0,33	0,70	0,98	1,00
Total unemployment rate,%	Ds	0,57	0,67	0,86	1,00	0,00	0,10	0,05
Ginny Index	Ds	0,50	0,71	0,57	0,71	0,99	0,00	1,00
Percentage of population living below the national poverty line,%	Ds	0,08	0,23	0,00	0,13	0,08	0,50	1,00
Share of Internet users in relation to the total population,%	S	0,00	0,19	0,41	0,60	0,79	0,88	1,00
Voting and Accountability	S	0,68	0,54	0,11	0,00	0,51	0,67	1,00
World Corruption Perceptions Index	S	0,00	0,60	0,40	0,20	0,40	0,60	1,00
Share of women's participation in national parliament,%	S	0,00	0,00	0,34	0,34	0,90	1,00	0,98
Percentage of population helping others,%	S	0,00	1,00	0,94	0,94	0,89	0,89	0,94
Volunteer share of population,%	S	0,06	1,00	0,41	0,94	0,76	0,00	0,18
Participation in POs per 1,000 people	S	0,34	1,00	0,90	0,84	0,09	0,11	0,00
The crime rate, the number of offenses per 1 thousand people	Ds	0,71	0,61	1,00	0,37	0,54	0,17	0,00
Number of traffic accidents per 1,000 people	Ds	0,00	0,29	0,11	0,19	0,81	1,00	0,55
Average level of the secondary education,%	S	0,00	0,04	0,16	0,52	0,84	0,84	1,00
Percentage of children not receiving primary education,% to the total number of children of the relevant school age	Ds	0,00	0,88	1,00	0,99	0,45	0,50	0,38
Life expectancy in years	S	0,00	0,59	0,73	0,97	1,00	1,00	1,00
Infant mortality rate, in thousands of children under 5 years	Ds	0,00	0,19	0,38	0,58	0,73	0,88	1,00
The level of public funding for health care,% of the state expenditure in total exspences	S	0,91	0,91	0,91	0,91	0,91	0,91	0,91

Note: S – stimulator; Ds – destimulator

Source: formed by the authors

Table A.11. Value of individual indices and integral index for assessment of social status of Ukraine taking into account weighting coefficients for the period 2010-2016.

Social indices	W	Year						
		2010	2011	2012	2013	2014	2015	2016
Fertility level	0,029	0,00	0,01	0,03	0,02	0,02	0,02	0,03
The difference between the number of marriages and divorces per 1,000 people	0,029	0,02	0,02	0,00	0,01	0,02	0,03	0,03
Total unemployment rate,%	0,059	0,03	0,04	0,05	0,06	0,00	0,01	0,00
Ginny Index	0,059	0,03	0,04	0,03	0,04	0,06	0,00	0,06
Percentage of population living below the national poverty line,%	0,059	0,00	0,01	0,00	0,01	0,00	0,03	0,06
Share of Internet users in relation to total population,%	0,088	0,00	0,02	0,04	0,05	0,07	0,08	0,09
Voting and Accountability	0,029	0,02	0,02	0,00	0,00	0,02	0,02	0,03
World Corruption Perceptions Index	0,029	0,00	0,02	0,01	0,01	0,01	0,02	0,03
Share of women's participation in national parliament,%	0,059	0,00	0,00	0,02	0,02	0,05	0,06	0,06
Percentage of population helping others,%	0,029	0,00	0,03	0,03	0,03	0,03	0,03	0,03
Volunteer share of population,%	0,059	0,00	0,06	0,02	0,06	0,05	0,00	0,01
Participation in POs, per 1,000 people	0,059	0,02	0,06	0,05	0,05	0,01	0,01	0,00
The crime rate, the number of offenses per 1 thousand people	0,118	0,08	0,07	0,12	0,04	0,06	0,02	0,00
Number of traffic accidents per 1,000 people	0,088	0,00	0,03	0,01	0,02	0,07	0,09	0,05
Average level of secondary education,%	0,029	0,00	0,00	0,00	0,02	0,02	0,02	0,03
Percentage of children not receiving primary education,% to the total number of children of the relevant school age	0,059	0,00	0,05	0,06	0,06	0,03	0,03	0,02
Life expectancy in years	0,059	0,00	0,03	0,04	0,06	0,06	0,06	0,06
Infant mortality rate, in thousands of children under 5 years	0,029	0,00	0,01	0,01	0,02	0,02	0,03	0,03
The level of public funding for health care,% of public expenditure in total expences	0,029	0,03	0,01	0,02	0,02	0,00	0,03	0,03
Social status index		0,25	0,52	0,56	0,57	0,59	0,56	0,64

Note: W – weighting coefficient

Table A.12. Comparative analysis of approaches to assessing the political situation in the country

Tool	Goal	What do they analyze
USAID		
Assessment of the democracy and governance	To evaluate the main aspects of governance to develop democratic governance strategies	Key political institutions and processes. Key political actors. Socio-political integration.
Assessment of the conflict	To identify and prioritize the causes and effects of violence and instability in the country	Incentives for conflict Access to resources Potential for conflict management Dynamics of country vulnerability
Estimation of destabilizing factors	To understand deeper the sources of instability in a country with a view to better-developing strategies and measures to overcome it	Social, political and economic causes of state instability Legality and efficiency of public administration
DFID		
Reasons for change	To evaluate the major issues of the political economy	The political economy Dynamics of change Structures, institutes and actors
Strategic Conflict Assessment	To assess the impacts and risks of conflict	Sources of conflict The political economy approach Structure, actors and dynamics
Assessment of social rejection	To assess institutional barriers to social exclusion and to investigate the social integration frameworks for a specific country	Economic, social and political dimensions of social rejection Power relations and institutions
Sida		
Power analysis	To understand power relations better	Political Economy Distribution of formal and informal power Institutions and structures
Multidimensional analysis of poverty	To provide multidimensional poverty analysis	Integrated economic, social and political analysis Structures, institutions and processes The dynamics of poverty
GERMAN DEVELOPMENT COOPERATION (BMZ and GTZ)		
Social and cultural studies of countries	To provide a brief analysis of political and social issues at the country level	Social groups; Legitimacy and functioning of state institutions and civil society; Structural obstacles to development
Management questionnaire	To analyze governance and political economy	Political institutions and their social activities, political figures
Conflict analysis	To analyze political and social conflicts in partner countries with a view to developing strategies for how to contribute to managing, mitigating and overcoming these conflicts	Causes of conflict Participants of conflicts Interests Resource

APPENDIX B

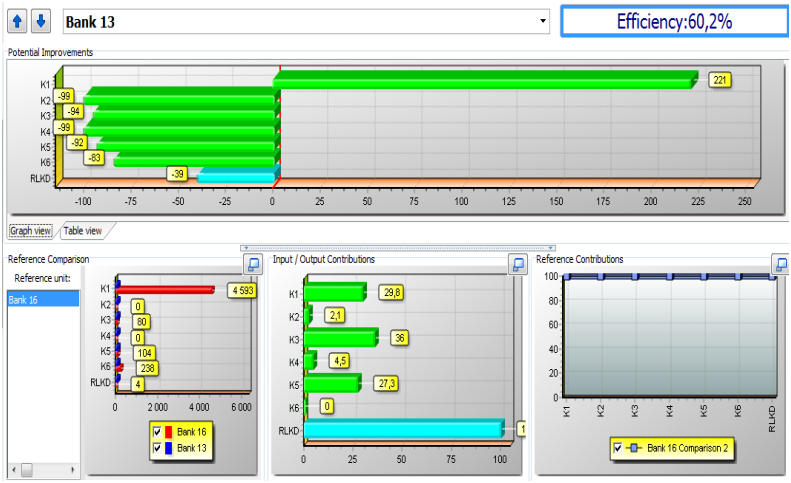

Figure B.1. Analysis of the efficiency and potential of improving financial monitoring for the Bank13 as of 2019 for the CCR model

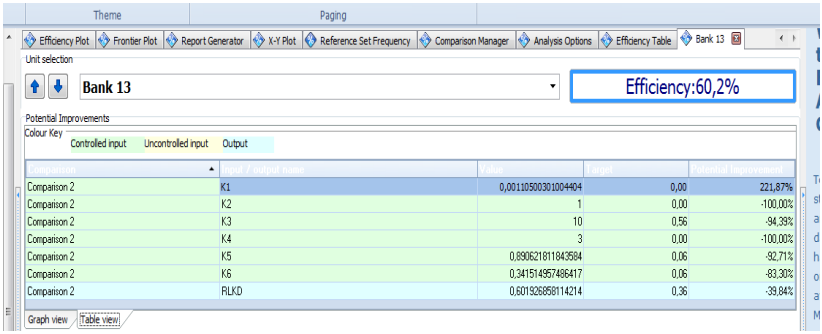

Figure B.2. Potential for improving financial monitoring for the Bank13 as of 2019 for the CCR model

Figure B.3.Analysis of the efficiency and potential of improving financial monitoring for the Bank13 as of 2019

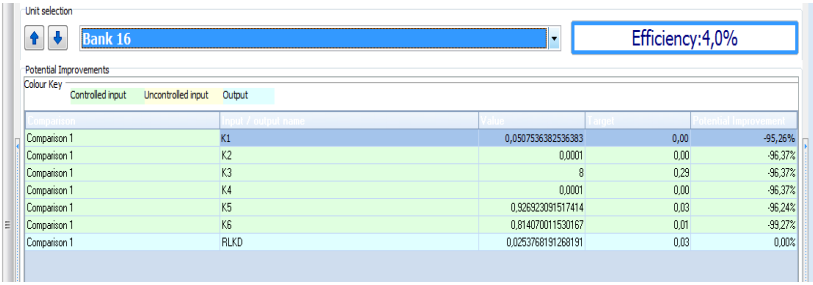

Figure B.4. Potential for improving financial monitoring for the Bank13 as of 2019

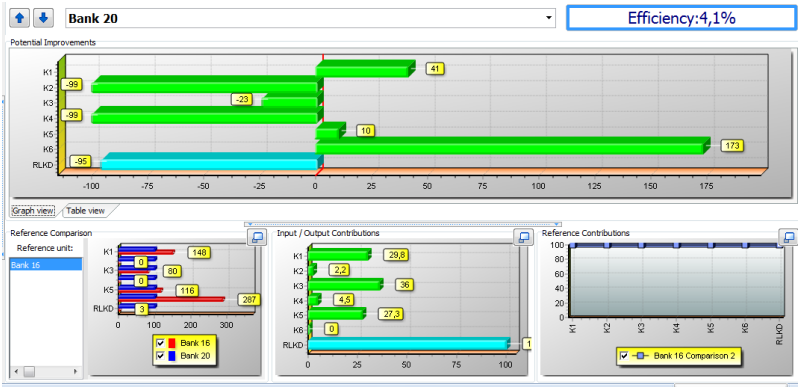

Figure B.5. Analysis of the efficiency and potential of improving financial monitoring for the Bank20 as of 2019

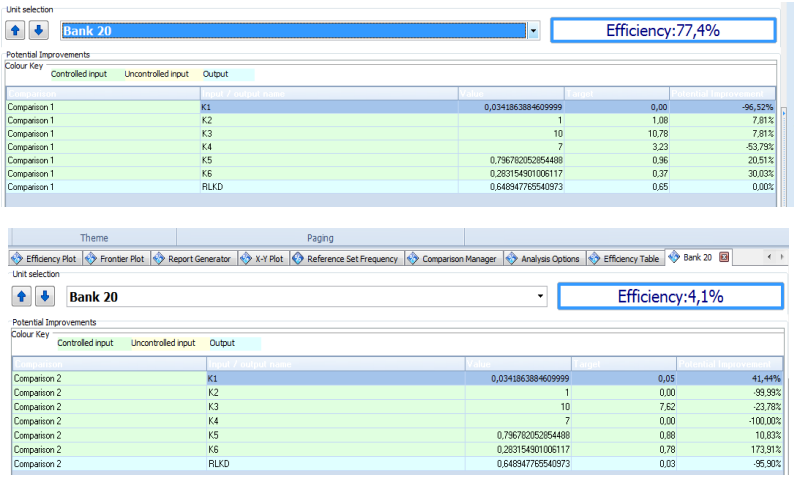

Figure B.6. Potential for improving financial monitoring for the Bank20 as of 2019

Figure B.7. Analysis of the efficiency and potential of improving financial monitoring for the Bank50 as of 2019

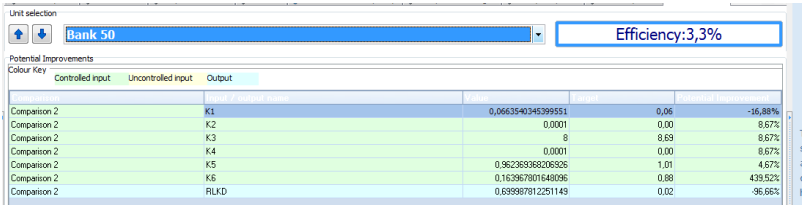

Figure B.8. Potential for improving financial monitoring for the Bank50 as of 2019

Inclusive Growth: basics, indicators and development priorities

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