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Forecast of changes in the macroeconomic situation in Ukraine: smart economy of the future

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Abstract: Aims: to theoretical development of methodological tools for selecting national priorities for sustainable economic development based on the concept of a smart future economy.

Methodology. This article uses a systematic approach to the study of change processes in the fields of macroeconomics, analysis and synthesis, induction and deduction, quantitative and qualitative scientific abstraction, comparison and analysis. Based on the modeling method, the article proposes a model for planning economic growth based on the indicators of socio-economic, investment, and innovation development of Ukraine and major countries of the world. **Results. The paper** proves the complexity of the problem of choosing the country's development priorities and its specialization, which is observed in many works of Ukrainian scientists and researchers from other countries. For this purpose, 40 scientific papers by foreign and domestic scholars were analyzed, and macroeconomic statistics data presented on official statistics websites were used. Based on the analyzed sources, the main problems of the socio-economic development of the country are determined, and the model provides a systematic approach to the formation and implementation of strategies for sustainable socio-economic development. The knowledge industry was developed, and a model was created for the selection of national innovative development priorities based on two main parameters: Overview of the national structure of innovative and specialized industries. The approach of information and communication platforms as a methodological tool for the formation of strategies for local socio-economic development is proposed. **Scientific Novelty.** With the help of the developed model, it is possible to determine the factors affecting the growth of Ukraine's GDP and forecast the growth of the country's economy. It is found that the transition to a smart economy and the use of the latest innovative smart technologies have the greatest impact on national economic growth. The proposed model for forecasting and evaluating the national socio-economic, investment, and innovation policy can provide the main directions for resource allocation and budgeting. **Conclusion.** The proposed proposals will contribute to the further development of an innovative program for socio-economic development of the country by applying the principles of the European concept of smart specialization to the Ukrainian economy. **Implementation.** The research materials can be used as methodological support for demonstrating the directions of regional socio-economic development.

Keywords: gross domestic product, economic development, forecasting, industry 4.0, stability.

Introduction

The economic situation in Ukraine is changing every year. Therefore, it is very important to constantly monitor and analyze microeconomic and macroeconomic indicators. For a deeper study of the economic situation in the country, macroeconomic factors should be taken into account to the greatest extent. The main macroeconomic indicator is the country's gross domestic product. A decline in economic growth may be characterized by a slowdown in consumer activity due to higher value-added tax rates, a temporary acceleration of inflation and, as a result, the real incomes of the society decrease.

Analyzing the dynamics of macroeconomic indicators and confirming growth factors is one of the primary tasks of economic forecasting and strategic planning. Macroeconomic indicators are the most important criteria that reflect the economic development and social conditions of a country. By analyzing these indicators, it is possible to assess and forecast the development of individual countries and economic sectors with high accuracy.

Analysis of the dynamics of Ukraine's macroeconomic indicators over the past 10 years shows that the economic situation in the country is deteriorating. The main factors of this situation are the instability of the external environment caused by the armed attack of the Russian Federation on Ukraine, the development of public consumer demand and the change of the national economy.

Research Problem

The deterioration of the national economy's development indicators necessitates constant analysis and monitoring of key macroeconomic indicators in order to achieve development stability and strengthen positions in the global market.

The problems of macroeconomic stability have been studied by economists from different countries. For example, Coscieme, Mortensen et. al. (2020) identified gross domestic product as the main factor determining the achievement of sustainable development goals. Estevão (2020) proved that fiscal policy can be designed to simultaneously stabilise the economy and public finances while promoting sustainable development. At the same time, the authors note that the pursuit of unconditional GDP growth risks not achieving development goals in general. In the European Union, it appears that GDP does not correlate with other indicators of economic activity, such as employment, but rather with indicators of environmental sustainability and general well-being. Thus, achieving sustainable development goals by continuously increasing GDP will impede the achievement of environmental and inequality reduction goals. Similar studies were conducted by Yumashev, Ślusarczyk, Kondrashev, & Mikhaylov (2020) and Bali Swain, & Yang-Wallentin (2020). Fatmawati, (2022) it has been proven that economic and financial instruments are closely related to GDP dynamics and are therefore of particular interest. At the same time, economic growth is influenced by investment activity, bank financing, and government spending. The analysis of quantitative dependence was carried out in the work. The results show that in the general estimation model, government spending, investment activity and bank financing can influence economic growth. However, in the long-run model test, government spending is the only variable that shows a positive trend in economic growth. Chugunov, Pasichnyi, Koroviy, Kaneva, & Nikitishin (2021) believes that the coordination of fiscal and monetary policy should be aimed at increasing social welfare and maintaining long-term macroeconomic stabilition. The authors Yin, & Xu (2022) and Vo et. al. (2019) also investigated and analyzed this hypothesis. Fioramonti, Coscieme, & Mortensen (2019) called for abandoning gross national product as a central indicator of economic policymaking. The authors argue that the combination of Anthropocene political reform and economic change has created a new economy that goes beyond GDP and focuses on well-being rather than material production. Instead, the SDGs require policymakers to protect ecosystems, promote greater equity, and focus on long-term equitable development. At the economic level, services are replacing industrial production as the main driver of wealth, thanks to innovative economic models that optimize supply and demand, drive growth, create value for people, and reduce output and costs.

Luchko, Arzamasova, & Vovk (2019) the possibility of planning the development of the human potential of the economy and studying the impact of this indicator on the country's gross domestic product is recognized. The study examines the dynamics and estimates of GDP, and indicators that characterize human potential. By establishing a factor model of the degree of dependence of GDP on a certain factor, its influence on the obtained indicators is proved. The report found that the biggest employment shifts were in information and telecommunications, manufacturing and finance, which almost doubled. Păunică, Manole, Motofei, & Tănase (2021) facts have proved that GDP is one of the most important indicators of national development and stability. Under the current economic situation, the importance of this macroeconomic indicator has become increasingly prominent, and international research has increasingly emphasized the importance of stability and sustainable development. GDP can be seen as both an obstacle to sustainable development and a tool for conservation. . develop. Environmental protection and achieving sustainable development goals. Therefore, the author believes that for the economy of a country or a group of countries, it is always important to understand the structure of GDP and the factors that affect it. The authors Sadriddinov, Mezina, Morkovkin, Romanova, & Gibadullin (2020) and Al-Qudah, Al-Okaily, & Alqudah (2022) proved this hypothesis. Anghelache, Anghel, Iacob, & Samson (2020) has been proven that GDP is the most comprehensive indicator of the

country's economic activity. GNP reflects the specific results of the development of the national economy and its ability to increase consumption, domestic investment and diversify the national economy.

Roszko-Wójtowicz, & Grzelak, (2020) in their work noted the impossibility of achieving several macroeconomic goals at once. The article analyzes six diagnostic variables that affect the economic situation in individual EU countries. Similar studies were conducted by Pimonenko, Us, Liulova, & Kotenko (2021) and Artemenko (2021). Thus, these studies emphasize the need to identify the industries that have the greatest impact on economic growth. An urgent task is to identify those industries where increased funding for the smart industry will lead to the greatest correlated economic effect. The article by Zolkover, & Renkas (2020) develops a methodology for assessing the integral level of macroeconomic stability of a country, taking into account epidemiological threats as additional factors of destabilization of the world economy. The authors of Tiutiunyk, Zolkover, Lyeonov, & Ryabushka (2022) developed this hypothesis in their work. Kashcha, & Dun (2022) analyzed the impact of the COVID-19 pandemic on macroeconomic stability indicators. Similar studies were conducted by Kurpayanidi (2020), Kashcha, & Dun (2022), and Loayza, & Pennings (2020). Thus, these works prove the effectiveness of financing the education sector and the introduction of smart technologies, which will lead to a positive economic effect. Increased investment in this sector will lead to an increase in macroeconomic indicators. However, more research is needed to predict the effectiveness of investments in the smart industry in other industries and the social sphere. For example, the papers prove the hypothesis that it is necessary to respond to changes in the economic environment and develop effective forecasts for further response to changes to achieve maximum economic effect. Landmann (2022) explored the historical preconditions for the settlement of political instability, emphasizing the close correlation between ideas, facts, and political components. The focus is on the resilience of market economies in the face of macroeconomic shocks. Authors from different countries considered macroeconomic growth in relation to the conditions and requirements of a particular country. For example, Rahman and Hossain (2020) conducted a study on Bangladesh, Szpunar (2020) examined the conditions of Poland, Kurpayanidi (2020) analyzed the macroeconomic stability of Uzbekistan, Ali, Wahid, and Ali (2019) studied Asian countries, Wang et al. (2022) studied the economy of China, Magazzino, Porrini, Fusco, & Schneider (2021), Pradhan, Arvin, Nair, & Bennett (2020) analyzed the Eurozone countries, Adedoyin, Bekun, Driha, & Balsalobre-Lorente (2020) analyzed the economy of the United States of America. This study focuses on analyzing and forecasting the increase in macroeconomic indicators of Ukraine's economy in the context of the introduction of smart technologies.

Thus, there are conflicting opinions in economic science about the role of gross domestic product in influencing national growth. Depending on the purpose of the study, this indicator can be used as a resultant indicator in analyzing the impact of factors on economic growth.

Research Focus

An analysis of international experience shows that state regulation of the national economy should be based on systematic and scientific provisions, and an alternative plan for future economic development should be proposed based on the economic situation, past and present data. Forecasts of market economy development are mainly based on the Keynesian concept of government influence on macroeconomic processes. In this regard, economic forecasts, like those of other developed countries, are based on the appropriate model of demand (private consumption, public spending, investment, and exports) and supply (production of goods and services, construction), and should refer to the macroeconomic model of the gross domestic product cycle.

Research Aim and Research Questions

The purpose of this paper is to combine the possible process of increasing competitiveness and ensuring sustainable development based on competition, which reflects the interdependence of factors

between the traditional system of sustainable development and its strategic goals in order to ensure the quality of life and create a basis for the transition to the smart economy of the future.

Based on this goal, the article solves the following tasks:

- analysis of macroeconomic indicators of Ukraine's development for the period from 2010 to 2022;
- priorities for the country's socio-economic development were developed based on ensuring the stability of macroeconomic indicators;
- analyzing the impact of the smart industry on changes in macroeconomic indicators;
- a model for forecasting economic growth based on the smart economy of the future was developed.

The subject of the study is socio-economic indicators, processes, and phenomena of economic development.

The object of research is the economic system of functioning in the country.

Research Methodology

General Background

Due to the rapid pace of change in the global and national economies, it is important to develop methods that allow for a quick and accurate analysis of the structure of the national economy. The need for such an analysis has become especially acute in the 21st century, when commodity prices on the global market have undergone significant changes and the impact on the economy has not been systematically studied. At the same time, an understanding of the current structure of the economy helps to make informed decisions in the field of fiscal and monetary policy, which is especially important given the growing trend of inflation in the global market, which significantly limits possible decisions at the national level. Equally important are high-quality forecasts of economic development, which can be used not only to improve the effectiveness of national economic policy measures but also to correctly assess the feasibility of many national projects.

Sample / Participants / Group

The study was conducted using data from official statistics on the overall macroeconomic development of the country. The analysis used statistical data from the Ukrainian economy with reference to and analysis of international statistics, mostly from the European Union.

Instrument and Procedures

The article uses systematic methods to study processes in the fields of macroeconomics, analysis and synthesis, induction and deduction, quantitative and qualitative analysis, comparison, and scientific abstraction. In considering the macroeconomic growth of the country, the Law “On Economic Development” was used, which was approved by the Verkhovna Rada of Ukraine. The main method of macroeconomic analysis is the modeling method since the model is one of the most important ways to understand and describe the real economic world.

Data Analysis

Abstraction is an important part of the process of developing a macroeconomic model. A predictive model is built to reflect the properties of objects that are relevant to the chosen research objective. The article finds an algorithm for the function of sustainable economic growth based on a combination of endogenous and exogenous parameters of the macroeconomic model. In this case, the exogenous macroeconomic model was used to analyze the creation of value from the outside based on

production technology and to analyze the behavior of stakeholders at different levels of the hierarchy, and the endogenous values described the ways to achieve the goal within the model.

Research Results

Sustainable development of the national economy has become the strategic direction of economic policy. So far, Ukraine's approach does not have a strategic component, focusing mainly on hotspot issues. Sustainable development is defined as indicators that support the sustainable development of the country, population, and business, sustainable growth of labor productivity, minimization of income fluctuations in economic sectors, aggregate demand, quality social and environmental living conditions, resource conservation, and people's access to goods, services, and labor. Macroeconomic indicators are the most important criteria that characterize the development and state of a country and society. By analyzing these indicators, we can fairly assess and forecast the development of countries and individual sectors of the economy. To forecast the macroeconomic situation, indicators calculated by the production method, the distributional or income method, and the cost method are used. Table 1 shows the advantages and disadvantages of each method.

Table 1

Advantages and disadvantages of methods of calculating gross domestic product

Method	Advantages	Disadvantages
Production method	can be used for rapid assessment, takes into account the future state of the economy	does not take into account future development prospects, requires a developed financial market
Income method	used for long-term forecasting, takes into account the state of the market and economic obsolescence	requires a detailed understanding of financial and economic activities
Cost method	allows you to determine the current state and calculate indicators for the short-term	requires detailing of each calculation element, difficulty in calculating financial indicators

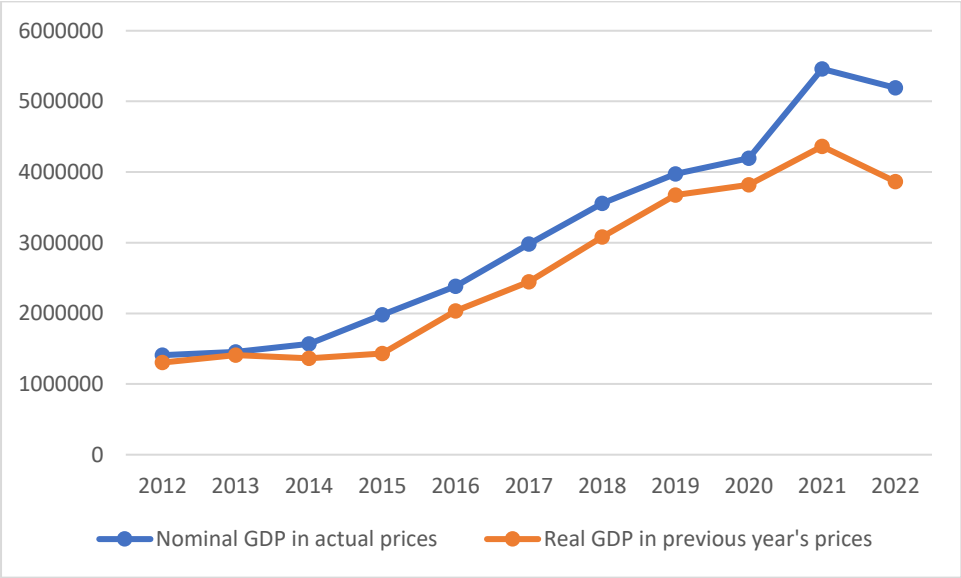
(compiled by the authors)

Given the shortcomings of each method, as well as the inability to separate out the cost estimate of negative factors, the cost estimate does not take into account the cost of non-market transactions, and does not take into account the cost estimate of the external environment, the cost method of macroeconomic forecasting was used for calculations.

The most important macroeconomic indicators that characterize the development of a country are: gross domestic product; GDP per capita; economic development; inflation; and unemployment rate. It is also necessary to highlight a number of indicators that describe a strong impact on the economy: industrial production index, foreign trade balance, employment rate, GDP deflator, and consumer price index. The above macroeconomic indicators allow us to understand the economic processes taking place in the national economy and analyze the state's activities in the field of national economic policy, set priorities, and make appropriate decisions. One of the most important macroeconomic indicators is the gross national product (hereinafter - GDP), the dynamics of which reflect the level of economic development. Figure 1 shows the dynamics of Ukraine's gross domestic product for the period from 2012 to 2022.

Figure 1

Nominal and real gross domestic product in the period from 2012 to 2022, UAH million



generalized by the authors based on "Gross domestic product (GDP) in Ukraine" (2023)

Figure 1 shows economic growth trends for the periods 2010-2013 and 2016-2019. During this period, the number of goods and services produced over a certain period of time increases, and opportunities for increasing production are created. In the period from 201 to 2016 and from 2019 to 2022, there is an economic recession. The reasons for this decline may be different. The main ones are shown in Figure 2.

Figure 2

Reasons for Ukraine's economic decline in 2010-2022 (compiled by the authors)

(compiled by the authors based on "Gross domestic product (GDP) in Ukraine", 2023*)*

The main reason for these phenomena is that the uncertainty of the recent economic and political situation has intensified during the sharp downturn, leading to a decrease in investment and a rejection of modern production and innovation. The positive development of such sanctions continues in the production of consumer goods, especially in the food industry in domestic production. Compared to the same period last year, the following sectors of the economy experienced the largest growth in the real

GDP index: agriculture, industry (mining, manufacturing, energy, air conditioning), organization and implementation of water supply, sewage, pollution control, construction, wholesale and retail trade, repair, transportation and storage of cars and motorcycles.

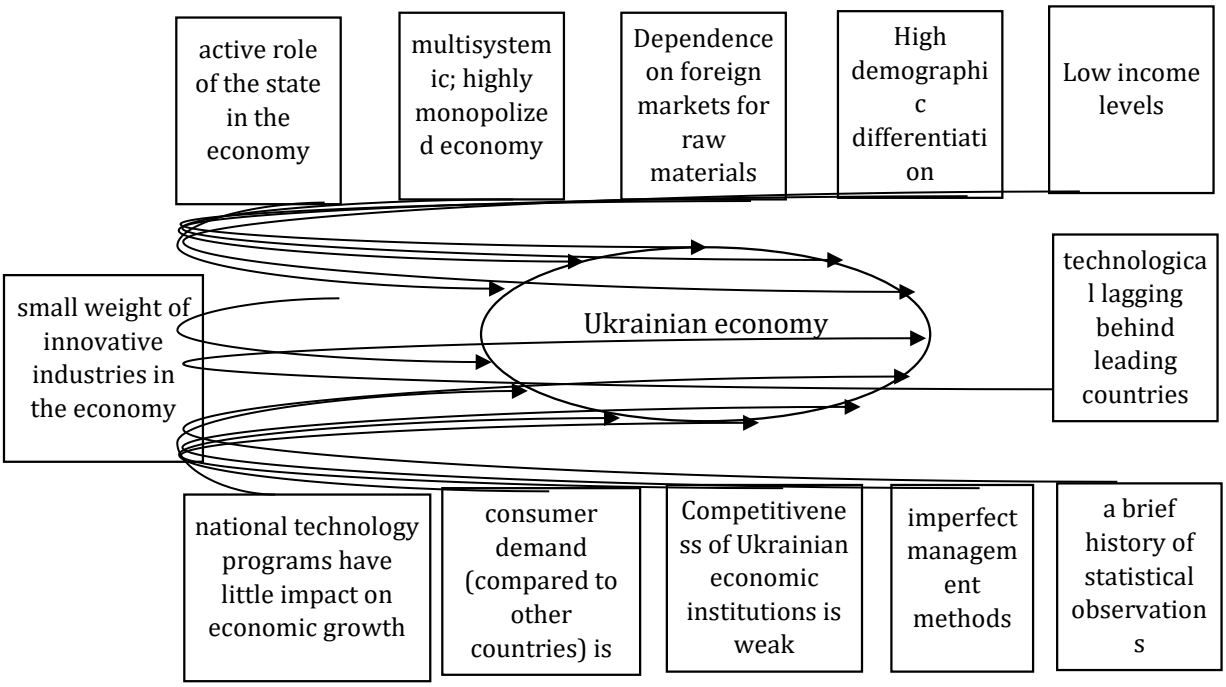
At the same time, meeting existing needs is not the basis for the sustainable development of Ukraine. How to achieve this in the conditions of the current crisis, falling GDP, and economic collapse (devaluation and inflation) is a central issue for the Ukrainian economy. One of the directions of sustainable development is the formation of a competitive economy and the study of the impact of various factors on the social, economic, and environmental components.

The solution to this problem may lie in the effective forecasting of macroeconomic indicators and the development of optimal economic policy. Forecasting macroeconomic indicators is one of the main contents of macroeconomic policy and has many important economic and political tasks. In making economic and political decisions, it is necessary to know the future in order to narrow down possible economic policy options and to obtain certain criteria by which to judge the quality of these decisions. From this perspective, macroeconomic forecasting can be said to be the most important task of analysis and monitoring.

So far, the most common methods of macroeconomic forecasting are mathematical methods, methods of forecasting the inter-sectoral balance, methods based on expected indicators of the economic situation, and expert methods. For this study, a combination of expected indicators and expert methods can be proposed as the most effective method for predicting an economic crisis. Leading indicators of the economic situation can be used for short-term forecasting of macroeconomic dynamics. Vo, Huynh, et.al. (2019) found that derivatives markets positively contribute to economic development in the short run in the United States, Japan, and India, but the effect fades in the long run. In China, the derivatives market has a negative impact on economic development in the short run. However, in the long run, we find a positive impact of the derivatives market on economic development based on two methods of long-run estimation, namely the dynamic least squares method and the fully modified least squares method. However, they should not be used in isolation from other forecasting methods. A qualitative analysis of the macroeconomic situation should always be carried out and it should be checked whether many indicators can fully reflect its main features. The method of expert evaluation is best suited for long-term forecasting of the overall development of the economy or short- and medium-term forecasting of macroeconomic indicators. The subjectivity of expert forecasts and their potential for manipulating public opinion can be partially overcome by combining this method with others. The combination of expected indicators with expert methods of assessment has proven to be the most effective for assessing the state of the economy. This is due to the following features of the Ukrainian economy (Figure 3)

Figure 3

Influence of factors on the formation of the Ukrainian economy



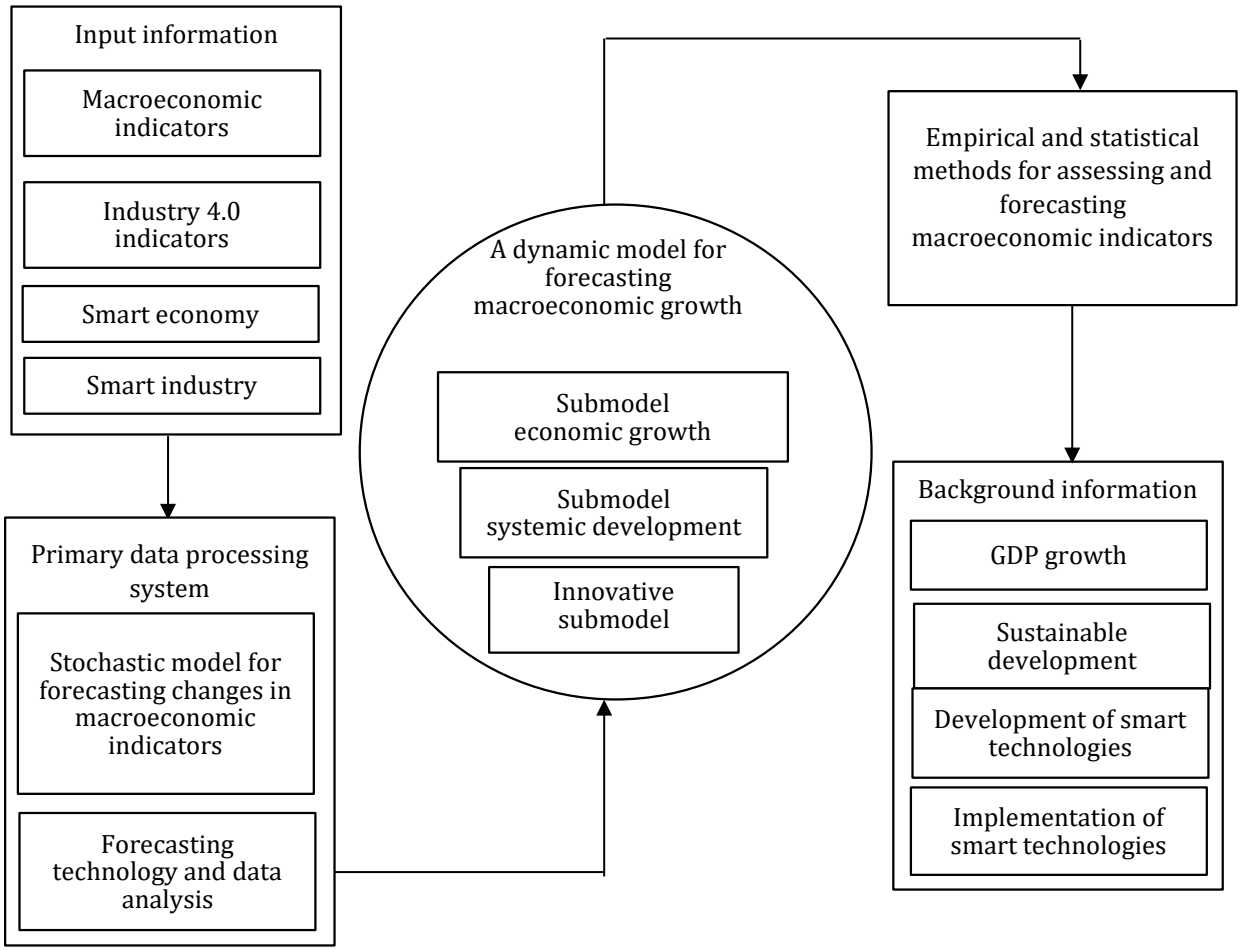
(compiled by the authors)

All of these features affect the possibility of a high-quality forecast of Ukraine's economic situation. From the perspective of forecasting, we can distinguish the opportunities offered to economists - favorable features for forecasting, namely, a strong link between the dynamics of gross domestic product and certain parameters of external dependence. The economic system is simple and low-level, which increases the predictability of public policy and risks - characteristics that complicate forecasts or significantly reduce their accuracy: high cyclical vulnerability, strong dependence on monopolies and public policies, economic inefficiency manifested in poor public planning, market monopoly, weak institutions, and immature governance. The application of mathematical methods of macroeconomic forecasting to the Ukrainian economy has led to a number of serious difficulties. The ability to choose a suitable mathematical method for almost any situation, combined with the fact that the underlying statistics often do not meet all formal requirements, can make the forecasting process unrepresentative. The likelihood of poor forecasts is very high. However, when objectivity and high formal requirements for the forecasting process are important as national planning and forecasting, mathematical modeling is necessary and can be combined with other methods. Methods for assessing the balance between professions are labor-intensive and can only be used by a large number of researchers. Given the high cyclical sensitivity of our economy and dependence on monopolies and government measures, there is a high probability of poor forecasts due to changes in prevailing trends, so additional monitoring of changes in the economic system and the involvement of specialists in the relevant field is needed. In addition, the lack of external parameters, such as events in the global commodity and capital markets, may lead to an underestimation of economic development. The amount of work and the high risk of poor-quality forecasts make this approach less effective.

Thus, forecasting economic growth based on the analysis of macroeconomic indicators is a complex systemic process (Figure 4). At the same time, the problem of ensuring the sustainability of the economic system depends on the quality of the forecast and the correct choice of the target direction of economic development.

Figure 4

A model for forecasting macroeconomic growth (compiled by the authors)



(compiled by the authors)

The way to address this issue is to move to smart technologies of the future. This approach began to be implemented during the COVID-19 pandemic and is gaining relevance during the military invasion of Ukraine by the Russian Federation.

Smart specialization is an innovative tool of the European Union aimed at enhancing regional competitiveness based on a comprehensive study of local conditions and opportunities and the knowledge economy. SMART specialization is an innovative approach to professional development and job creation in Europe, enabling every region to identify and expand its competitive benefits.

The prospects and benefits of implementing smart technologies are as follows:

- The approach is evidence-based, taking into account all the strengths, opportunities, and barriers in the region and the country as a whole, including external perspectives, the potential for cooperation, and global value chains;
- There are no top-down solutions, instead a dynamic entrepreneurial process is encouraged that brings key stakeholders together around a common vision;

- Not only technological innovation is encouraged, but also various forms of innovation using existing or new knowledge;
- ecosystem approach is supported: creating an environment for change, institutional efficiency.

Through partnerships and a bottom-up approach, SMART specialization brings together local governments, universities, corporate bodies, and civil society to implement long-term growth strategies with the support of European funds. According to the European Union's rules, a smart specialization strategy is a national or regional strategy that prioritizes creating a competitive advantage by developing the strong scientific and innovative aspects of a region or industry and adapting to business needs, developing markets through integration, avoiding duplication and fragmentation. Smart specialization strategies can be developed independently or in conjunction with national or regional research and innovation strategies. Huseynov, I. A., Illiashenko, T., & Petroke, I. (2021) confirmed the hypotheses about the functional links between the foreign economic and investment activities of countries and the level of innovation development of the country in accordance with the level of economic development.

The EU has long believed that the basis of policies aimed at eliminating interregional conflicts is the intensification of research activities, rather than the ongoing support of backward regions or even the creation of universally beneficial investments. A business climate of medium or low research intensity does not guarantee a permanent decline in regional development. In addition to the European Expert organizations, independent professional agencies and organizations at the international level, such as the United Nations Industrial Development Organization (UNIDO), the World Bank, and the OECD, are involved in promoting the concept of smart specialization and implementing the approach. According to the OECD definition, SMART specialization is the innovative industrial foundation of a regional economy, and its purpose is to represent national political, structural conditions, especially research and development policies. Investments in innovation can influence the economic, scientific and technological professional orientation of regional development, thereby influencing its specialization, competitiveness and professional development.

Regional smart specialization strategies are comprehensive programs of local economic change based on the following principles:

1) Supporting key priority areas in the development of high knowledge intensity and direct investment policies. The number of priorities should be very limited in order to pool resources and generate enough innovation to reach world leadership in the implementation process. Since only leadership can produce significant positive results in the form of huge added value; Specialization - focusing on competitive advantages and real growth potential supported by different activities and resources;
2) Focus on strengths and competitive advantages in each area. It is a local procedure that takes into account the benefits and resources of each region and its optimal socio-economic reasons to identify specific opportunities for development and growth.
3) Encourage active participation of stakeholders in regional development. Priorities should not be top-down, but rather a collaborative and interactive process in which stakeholders, market forces, and the private sector inform new policies and government institutions that evaluate results. and empower active individuals to realize this potential;
4) encourage investment in business life to support innovation - The strategy should include a wide range of innovations and support technical and social innovations that allow each region to make policy decisions according to its unique socio-economic conditions;

5) Evidence-based, including a robust monitoring and evaluation system and a review mechanism to update strategic options.

In 2016, the European Union created the SMART Specialization Platform for Industrial Modernization to combine SMART specialization with interregional cooperation to improve industry competitiveness and innovation potential (Chiordi, Desogus, et.al., 2022). The main goal of the Smart Specialization Platform is to coordinate the efforts of EU regions, their clusters, and industrial partners to create investment projects in the field of smart specialization through interregional cooperation (Cohen, 2019).

The Regional Smart Specialization Strategy is a comprehensive plan for local economic transformation based on the following principles. The key priorities are to support the development of knowledge-intensive production and centralize investment policy. To gather resources and create enough innovations to achieve global leadership in implementation, the number of priorities should be very limited. It should be borne in mind that only leadership can bring significant positive results in the form of high-added value; Specialization is supported by a variety of business processes and resources focused on competitive advantage and real growth potential. Focusing on the individual strengths and competitive advantages of each region is a local approach to identifying unique benefits for development and growth, taking into account each region's available assets and resources, as well as its optimal socio-economic challenges. Active participation of stakeholders in regional development is encouraged. Prioritization should not be top-down, but rather a participatory and interactive process in which stakeholders, market forces and the private sector generate information about new policies, authorities generate assessment results, and enable active people to realize this potential. Support innovation by stimulating business investment - the strategy should include a broad range of innovations and support technological and social innovation, allowing each region to include robust and evidence-based monitoring and evaluation systems and evaluation mechanisms to update strategic decision-making. These principles can be effectively applied in Ukraine. Therefore, future policies of national and regional authorities should be aimed at realizing and implementing these principles to achieve sustainable development of the economic system.

Discussion

The influence of smart technologies on economic development and growth is controversial and is discussed not only among Ukrainian scientists, but also among researchers of other fields and countries. For example, Nižetić, Djilali, Papadopoulos, & Rodrigues (2019) learn about the link between the adoption of smart technologies and economic growth. The work emphasizes that the main task is to reduce the consequences of global warming and ensure balanced socio-economic development. Achieving interdisciplinary synergy and mastering complex technical issues requires close cooperation of all involved engineering disciplines. Research focus should be on resource balance, efficient energy conversion technologies, integration of renewable energy systems, efficient methods for achieving a closed-loop economy, efficient integration of processes and systems with other issues of social importance. Saunila, Nasiri, Ukko, & Rantala (2019) the study of 280 SMEs found that corporate sustainability strategies strike an appropriate balance between smart technology and environmental sustainability, and smart technology and social sustainability. The authors conducted a similar study Van Fan et.al. (2019). Furthermore, smart technologies have a direct and significant impact on the sustainability of the economy, but this linkage is also driven in part by corporate sustainability strategies. Lim, Edelenbos, & Gianoli (2019) smart technologies are studied as the development of innovative cities aimed at sustainable development and high quality of life. This paper adopts the method of systematic research and summarizes the successful experience of smart technologies development. According to the analysis, the author did not prove the impact of smart technology on the benign development of cities and sustainable economic growth. Terziev & Klimuk (2021) a correlation between model of "education, business, government and science" based on the principle of intellectual

specialization is proposed, and the possibility of its application and implementation is emphasized. A successful model for organizing activities is a partnership based on the principle of deep specialization. To increase the innovative potential, cooperate in the fields of education and science, the real sector, business life, the public sector, the public sector. Martin, Evans, Karvonen, Paskaleva, Yang, & Linjordet (2019) the computerization of complex processes and the development of modern innovative technologies are expected to have a positive impact on GDP growth. The article proposes the direction of informatization of innovative technologies to ensure the macro trend of circular economy, showing the way of development at national, global and enterprise levels.

Thus, most scholars confirm and prove the existence of a correlation between the development of the smart industry and the improvement of macroeconomic growth indicators. At the same time, some scientists do not confirm that such a connection is possible.

Valle-Cruz et al. (2022) claim that smart systems are capable of optimal analysis and calculation of great volumes of data. Myovella et.al. (2020) have shown that new technologies have played a significant role in the economic activity of both developed and developing countries, including the availability of communications, which was hampered by poor infrastructure, the residence of the majority of the poor who were initially financially excluded from mobile banking, and the participation of small and medium-sized enterprises. At the same time, the use of smart systems is not possible for forecasting and decision-making on sustainable development. Chu, Cheng, & Yu (2021), Qian, Liu, Cheng, & Forrest (2021) discuss the creation of smart technologies to reduce the burden on the environment and build environmental awareness. At the same time, the authors do not link the development of the smart industry to macroeconomic indicators and the sustainability of economic growth. Mosteanu, & Alghaddaf (2019) show how a smart approach to financial and fiscal legislation, together with an innovative and effective governance system, can lead to rapid economic growth and impressive social development. Rigby, Roesler, Kogler, Boschma, & Balland (2022) shows that EU cities that perform better in terms of integrated and connected technologies have an economic advantage compared to cities that perform poorly in terms of knowledge base complexity and connectivity.

Thus, the issue of the relationship between improving macroeconomic indicators and the introduction of smart technologies is controversial and requires further study and analysis. For example, the authors (Popova, Chechel, et.al., 2023) calculated the correlation between the use of smart technologies and economic growth. The analysis did not establish a close relationship between these indicators. That is why it is necessary to conduct detailed research on the factors that affect economic growth in the context of Industry 4.0. A separate debatable issue is the feasibility of increasing the cost of implementing smart technologies. Currently, there is no close correlation between the growth of macroeconomic indicators and digitalization costs. For example, the impact of the development of smart technologies in the education sector during the COVID-19 pandemic has been proven (Agarwal, Swami, & Malhotra, 2022), and there is evidence of the impact of the development of smart technologies in the tourism sector (Garcia, Linaza, Gutierrez, & Garcia, 2019), but there is no comprehensive assessment of the impact of priority sectors of the economy on economic growth. In our opinion, it is necessary to develop a multi-complex of priority sectors of the economy that have a close correlation with macroeconomic indicators. This will allow for an efficient allocation of limited resources and greater economic impact.

Conclusions

The implementation of smart technologies can increase gross domestic product per capita and lead to population growth. However, without the right vision, plans, talent, and funding, smart technologies programs will not reach their full potential to deliver economic, social, and productivity benefits. Cloud technologies, mobile applications, citywide data platforms, IoT/sensors, biometric recognition, and geospatial technologies are now increasingly being used and applied in planning and

forecasting. В роботі Afonasova et.al. (2019) At the same time, the cost of smart applications is increasing with the maturity of the smart technologies and the implementation of smart. The future of mobility lies in multimodal systems connected by smart technologies. Given that scientists consider the environment to be the main problem to be solved by smart industry programs, and the main benefits are improved public safety and health, financing smart solutions remains a key concern for most scientists. In three years, public-private partnerships will be the dominant financing technique, using concessional funding, limited revenue funding and local budgets that can be applied more frequently than at the current level of governance.

Digital platforms are changing the way customers, employees and employers interact as chips are added to just about everything, from buying products online to finding partners on websites. As computing power grows exponentially and more and more people around the world participate in the digital economy, there is a need for policies that take full advantage of the digital revolution and minimize data loss. This will not only change jobs and skills, but in the near future will transform industries such as retail and printing, and possibly even shipping and banking. Meanwhile, anonymous cryptocurrencies like bitcoin pose challenges to combating money laundering and other illicit activities, but while these assets are attractive, they are also potentially dangerous. Cryptocurrencies can be used to sell illegal drugs, weapons, hacking tools and toxic chemicals. On the other hand, blockchain, the technology behind these currencies, could revolutionize the financial industry by making transactions faster and more secure, while better information about potential customers could improve credit scores by better estimating repayment probabilities. Legal and regulatory frameworks must ensure financial integrity and consumer protection while supporting efficiency and innovation.

Implications

Thus, there are more failures due to errors in calculations that cannot be applied and calculated efficiently on modern computers. In this regard, new approaches to creating products using the latest technologies are possible. In this case, the latest communications at the international level can be based on outdated standard solutions.

To minimize inconsistencies, it is necessary to adapt the developed rules and norms of relevant digital data, taxation standards, features of labor organization and elimination of inequality in accordance with the latest realities. If an adequate policy of international cooperation and regulatory legislation at the national level will be developed, only then will it be possible to use these modern technologies to maximize public welfare and preserve all the advantages of smart technologies.

Limitations of the article

This study was conducted to determine the impact of the effectiveness of forecasting investments in the smart economy on key macroeconomic indicators. At the same time, forecasting should include more factors and sectors of the economy. It is necessary to further conduct a detailed correlation and regression analysis of the impact of macroeconomic indicators on the formation of an optimal system of financing sectors of the economy. Also, this study considered only the economic sphere and is not aimed at forecasting the social sphere, which is particularly relevant in the period of economic destabilization during Russia's military invasion of Ukraine.

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