MYKOLAS ROMERIS UNIVERSITY
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EVALUATION OF PUBLIC DEBT MANAGEMENT IN UKRAINE

A master's thesis

Supervisor
Assoc. prof. dr. Liucija Birskyte

VILNIUS, 2023

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INTRODUCTION

The relevance of the topic. The current stage of the development of the world economy is characterized by the active measures applied by the central banks all over the world to reduce the enormously high level of inflation which was caused by the implemented quantitative easing in order to stimulate economic growth during the pandemic “COVID-19” crisis. In the conditions of the growth of central banks interest rates as well as sharp increase in the amount of total world debt, the effective management of public borrowings, aimed at minimizing the cost of debt service and maximizing the return on its use, becomes extremely important. Nowadays, government loans are becoming almost the most important element of the financial policy of any country in the world. On the one hand, effective and rational use of borrowed funds provides a stimulation of economic growth and development of innovative projects. On the other hand, lack of coordinated and justified debt policy leads to disruption of financial stability and financial crises.

The relevance of evaluation of public debt management in Ukraine is ensured not only by crisis phenomena in the world economy, European integration processes of Ukraine and a long history of the lack of debt planning in the state, but also by the need for the country's physical survival during resistance to full-scale aggression. In the end of 2022, the public debt of Ukraine was 111.4 billion $US and compared to 2021 it increased by 13.5 billion $US or 13.8% (The Ministry of Finance of Ukraine, 2023). The real Gross Domestic Product (GDP) of Ukraine decreased in 2022 by 19.7% (State Statistics Service of Ukraine, 2023) that had a significantly negative effect on the public debt to GDP ratio, which grew from 49% in 2021 to 69,4% in 2022 (The Ministry of Finance of Ukraine, 2023). The limited financial resources, the impossibility of borrowing funds in foreign markets, the limited amount and high cost of domestic resources determine the need for the Ukraine to conduct a deep financial cooperation with international financial organizations and the governments of the economically developed states, which is possible only with the implementation of the most effective management of public borrowing that is achievable in current conditions.

The novelty of the study. For the first time since World War II, Ukraine is facing unprecedented financial and economic challenges. The assessment of the management of state loans in such conditions requires special accuracy and high quality, because it can become not only the fundament for post-war economic recovery, but also a basis for the stable functioning of the state finance system in such a difficult condition. The study of the current condition of the internal and external debt and evaluation of its management in Ukraine in the conditions of war is a new and relevant topic.

The scientific basis of the evaluation of public debt problem is founded by prominent foreign and Ukrainian scientists. The examination of the best sources of public debt repayment was the focus of the

writings of international economists such as R. J. Barro (2008), A. Afonso, & J. Jalles (2013), and N. V. Bon (2015). Many Ukrainian scholars, such as, S. V. Oleksiychuk (2017), I. S. Miroshnychenko (2014), O. L. Shelest (2017) and others, made efforts to study the socio-economic prerequisites and consequences of the formation of public and private sector debt obligations, as well as to develop conceptual frameworks for public debt management so as to ensure the stability of the financial system and to expand the investment potential of Ukraine's economic sector. Theoretical and empirical aspects of study of the public debt formation and service, debt policy implementation and countries' debt credibility assurance are presented in the scientific works of L. P. Londar (2016), L. O. Merenkova (2018), O. V. Cheberiako, & N. M. Pasichna (2016), V. Tereshchenko (2016), etc. Among the scholars who conducted a thorough professional study of public debt and its relationship to economic growth is N. Roubini (2020, 2021) who in his work explored the risks of debt crises in the world economy in the post-pandemic period and concluded that prolonged stagflation is inevitable, both in the case of continued soft fiscal and monetary policies and in the case of anti-inflationary measures. The majority of the studies and recommendations regarding the public debt and its administration are fully justified for peacetime, however, the features of the military economy and the corresponding directions and volumes of resources usage have not been investigated to the required extent.

The scientific problem. The insufficient level of effectiveness of state borrowing management in the peacetime is an extremely negative situation that restrains economic growth and leads to an increase in the tax burden as well as deterioration of financial stability. However, during the war, such conditions are threatening the very physical existence of the state and its economy. Throughout the independence, Ukraine experienced problems typical for countries with developing economies related to debt management, that became especially evident during the war. That is why the study of the current condition of the public debt, the assessment of its administration in Ukraine and the development of proposals to increase the level of debt sustainability in wartime circumstances is a very important task in modern conditions and needs in-depth analysis. Discussion on this socio-economically significant issue can be constructed on **the main research question: What is the current situation of the public debt management in Ukraine and what can be done to increase the level of the public debt credibility and sustainability?**

Object of the research. Public debt of Ukraine.

Subject of the research. Evaluation of the dynamics and the current state of internal and external public debt of Ukraine in modern conditions.

Research aim. To evaluate the conditions and dynamics of public debt of Ukraine and identify the actions that would increase the level of the public debt credibility and sustainability through the improved management.

The objectives of the research:

1) To describe the concepts and analyze essences of “public debt” and “public debt management”.

2) To study the dynamics of changes in the amount of the public debt of Ukraine, main reasons and consequences of it.

3) To analyze the main influencing macroeconomic factors on the public debt dynamics as well as evaluate the strength and nature of their impact.

4) To define the level of debt credibility and sustainability in Ukraine and develop recommendations for its improvement through the more efficient public debt management.

The main scientific result of the research: During this research the complex combination of the interrelated indicators and evaluation methods for the assessment of the public debt management in Ukraine was employed. In addition, the new methodology for public debt credibility and sustainability integral indicator calculation with normalization and equalization of parameters was formed by the author. This combination of analysis instruments can be used in the comprehensive evaluation of the public debt management in other countries with emerging markets.

The practical implications of the study: The results of conducted research as well as formed recommendations may contribute to the increase in the level of the public debt credibility and sustainability in Ukraine through its management which will ensure stable functioning of the state finance system during the wartime and stable economic recovery after the victory.

The structure of the research: This research is divided into several parts consisting of the introduction, theoretical and methodological aspects of public debt and its management, methodology of research, systematic empirical evaluation of public debt management in Ukraine, assessment of Ukraine’s debt credibility and sustainability level as well as the conclusions and recommendations, list of references, abstract, summary and appendices.

1. THEORETICAL ASPECTS OF PUBLIC DEBT AND ITS MANAGEMENT

1.1. Nature, structure and functions of the public debt

Nowadays, public debt as a macroeconomic category is a part of the financial system of the countries all over the world, regardless of the level of their socio-economic, scientific and technical development. The need for public borrowing arises due to the fact that the functioning of the state is limited by its fiscal capabilities, which are ensured mainly by tax revenues. Financing of the public expenditures during the period of their significant growth due to various reasons with the help of taxes, as the main source, is an extremely difficult task, so the governments all over the world constantly carry out the search for alternative methods of financing of the budget needs, the main of which is public debt. Throughout the history of the development of the world economy, public borrowings were used to finance wars and post-war reconstruction, economic, scientific and technological progresses, smoothing financial cycles and surviving during financial crises, overcoming the consequences of natural and man-made disasters, and solving important social problems. That is why the nature of the public debt and its consequences for the stable economic development of the state in the short- and long-term perspective were analyzed and discussed by representatives of various economic schools.

The first thorough scientific economic studies on the causes and essence of public debt were carried out by mercantilists at the beginning of the 16th century (Medema & Samuels, 2013). Representatives of this stream of economic science are T. Mann and J. Law (Law, as cited at Murphy, 1997). The object of research of mercantilists was the sphere of money circulation: the inflow of money into the national economy was considered as a positive factor and the main part of state revenues. According to the system of views of mercantilists, the state performs the role of an “entrepreneur”, carrying out an active intervention in the system of economic life, including the financing of public expenditures through the public borrowing (Law, as cited at Murphy, 1997).

The concept of public debt was also studied by the physiocrats, who, unlike the mercantilists, believed that the source of the nation's wealth was agriculture, and their research was mainly based on the sphere of production (Kene, as cited in Meek, 1962). The main idea of the physiocrats was the complete economic liberalism. They argued that when making loans, the state diverts resources from productive sectors of the economy, which prevents the creation of new added value and multiply the “unproductive class of the population” (Kene, as cited in Meek, 1962).

According to the scientists of the classical school of economic theory, the prominent representatives of which are the scientists A. Smith and D. Ricardo, the public debt as an element of the budget mechanism should perform exclusively the role of a financial and not a regulatory instrument. It

was stated that “The growth of huge debts may ruin the large nations of Europe” (Smith, 2002). Scientists of the classical school of economic theory also pointed out that when the amount of public debt increases, the taxes grow, which causes the outflow of capital and a decrease in the nation's wealth. The public borrowings were considered as being not appropriate for covering public expenses, as they might make the state less frugal trough distortion of the information about its true financial condition (Ricardo, 2015). In general, D. Ricardo and A. Smith negatively evaluated the practice of credit financing of public expenditures for capital accumulation, as they are unproductive by their nature. In the works of D. Hume was also assessed the impact of public debt on the existence of the state. It was believed that it is necessary to reduce the amount of public debt to zero, because otherwise the debt will destroy the nation (Hume, as cited in Rostow, 1993). From the J. S. Mill’s analysis of this phenomena, it is possible to clear out the idea that a significant amount of public debt is one of the main causes of crisis phenomena, as it leads to price growth, which is the cause of trade crises (Mill, 1848). Thus, classical political economy formed mainly a negative attitude towards public debt because it was considered as the reason for the reduction of the wealth of the nation and national investments, as well as the restraint of capital accumulation **(**Medema & Samuels, 2013**)**.

The German scientist K. Marx, in his work “Capital”, paid considerable attention to the public debt and described it as the one of characteristic of capitalist states (Marx, 1867). The discussion was built on the opinion that the only part of the so-called “national wealth” that is really in the common possession of modern peoples is their national debts. K. Marx claimed that public debt was one of the strongest tools for the initial accumulation of capital, and public credit was a “symbol of capital's faith”. Also, the consideration of the naturality of the positive relationship between the state's wealth and its debt was widely grounded in the Marx’s works.

According to Keynesian theory, public debt is an instrument of influence on the economy. J. M. Keynes in his work “The General Theory of Employment, Interest and Money” emphasized that the purpose of the state is to actively regulate its economy, since the market system is not self-regulating and perfect enough to ensure stable economic growth (Keynes, 1937). Within the framework of Keynesian economic theory, the public debt was considered as a key element of the state employment policy, as it made it possible to revive the market situation and, as a result ensure the growth of national wealth. Supporters of “Keynesianism” also noted that the public debt is a source of tax reduction, increase in the volume of financial investments and consumption in the economy.

Contrary to the Keynesian policy of stimulating demand, M. Friedman, the founder of monetarism, came to the conclusion in his research that debt financing of public expenditures ultimately stimulates inflationary processes (Friedman, 1977). The impact of public debt was considered primarily through the monetary components of economic growth, such as prices, interest rates, and private investment: when the state borrows on the financial markets, the growth of interest rates is stimulated, which is the

reason for the effect of crowding out of private investments. In general, monetarists supported the idea of reducing public spending as a tool for influencing macroeconomic processes. However, the use of public debt as an instrument of stabilization policy was considered as ineffective.

The issue of public debt was thoroughly investigated in the scientific works of J. M. Buchanan, the founder of the theory of social choice. In the monographs written by J. M. Buchanan in co-authorship with M. James and R. Wagner was carried out a thorough review of the theoretical postulates of the Keynesian macroeconomic theory about the meaning of public debt. It was concluded that the growth of public expenditures is subject to the "cost-benefit" rule, that is, politicians are more willing to go for debt financing of the budget deficit than for financing it through additional taxation of voters, which creates "fiscal illusions" (Buchanan, as cited in Tempelman, 2007**)**. The public debt was considered as a financial burden for future generations, and the economic cost of borrowing was explained as: increasing current consumption due to debt financing lowers the borrower's living standards in the future (Buchanan, as cited in Tempelman, 2007**)**.

Famous Nobel laureates, such as P. Krugman and J. E. Stiglitz, criticized the policy of "austerity", which includes measures to reduce budget deficits and the level of public debt, thus following the thesis of J.M. Keynes that "saving should be done during a boom, not a recession" (Stiglitz, 2006). The formation and essence of the public debt were highlighted by J. E. Stiglitz in his economic works and discussed the opinion that during crisis conditions in the economy, strict budget austerity should not be used, because such measures exacerbate crisis phenomena even more. Therefore, deficit financing of state programs and an increase in public debt can be used if there is a justified need. The reduction of interest rates, the creation of new places for investments and the restoration of the ability to pay the public debt were included in the strategy of economic growth (Stiglitz, 2015).

Active discussions about the impact of public debt on macroeconomic and financial stability have resumed after the global financial crisis of 2008. Thus, in 2010, C. M. Reinhart and K. Rogoff's study "Growth in the Debt Period" was published, which assessed the relationship between economic growth and the ratio of public debt to Gross Domestic Product (GDP). The scientists came to the conclusion that the volume of public debt more than 90% of GDP leads to recession and the decline of the economy by 0.1% **(**Reinhart & Rogoff, 2010). The results of this analysis were taken into account even when developing the budgets of some Western European countries. However, in 2014 the work of T. Herndon, M. Ash and R. Pollinn was published, in the very title of which was a challenge to the reliability of the studies of K. Reinhart and K. Rogoff. Scientists pointed out the econometric errors made in in that published research, and based on the analysis of twenty leading economies, they showed that with a public debt of 90% of GDP, economic growth was 2.2% **(**Herndon, Ash & Pollinn, 2014**)**.

In the research of modern economists of International Monetary Fund (IMF) done by J. D. Ostry, A.R. Ghosh, R. Espinoza, the problem of the justification of budget consolidation and reduction of public

debt for developed economies was considered from the standpoint of "cost-benefit" analysis. It was concluded that the losses from temporary tax increase or reduction in public spending that are necessary to reduce the public debt, can be much greater than the benefits from reducing crisis risks by the debt growth (Ostry, Ghosh & Espinoza, 2015). According to the study conclusions, states with a high level of economic development, when choosing between maintaining a larger nominal debt, which can be compensated by a decrease in the debt to GDP ratio due to economic growth, and ensuring a budget surplus to reduce the public debt, should choose the first variant.

On the basis of the conducted review, it can be stated that most scientists recognize debt financing as an integral and objective component of macroeconomic policy, however, its economic consequences depend on the directions of its use, sources of formation and stage of the economic cycle. Throughout the development of economic thoughts, views regarding the issue of the existence of public debt ranged from its complete denial to justification as a functional element of the state's macroeconomic policy. With the development of social and economic functions of public finances, new tasks arise on the study of the public debt problems both within the framework of separate countries and in the global economy.

In order to further analyze the nature of public debt, it is necessary to investigate the definitional essence of this macroeconomic phenomenon (see Table 1).

Table 1. Definitions of the term "Public debt"

Author	Public debt is…
S. V. Oleksiichuk	A form of credit-financial relations in which one state acts as a borrower, and foreign governments and international funds act as its creditors **(**Oleksiichuk, 2017, p. 23**).**
I. S. Miroshnychenko	The sum of the state's debt obligations to foreign and domestic creditors, including obligations under state guarantees, taking into account loans interest, that are payable within the established terms, in accordance with the principles of borrowing (Miroshnychenko, 2014, p. 107).
T. I. Yefymenko, S. A. Yerokhina, T. P. Bohdan	The financial obligations of the government or the general public administration sector, that are subject to repayment and maintenance within the established terms, with the payment of a specified interest for the use of the loan (Yefymenko, Yerokhina & Bohdan, 2014).
H. M. Skorokhod	The amount of debt for all public debt obligations, interest on it and unfulfilled financial obligations of the state to economic entities (Skorokhod, 2021, p. 33).
K. V. Krasilnikova	The amount of the state's indebtedness for issued and unpaid domestic state borrowing, as well as the amount of financial obligations to foreign creditors as of a certain date, including issued guarantees for loans granted to local authorities, state-owned enterprises, foreign suppliers, etc. (Krasilnikova, 2018, p. 167).
O. O. Borzenko	The indebtedness of state bodies as a result of the formation of additional resources of the country aimed at solving contradictions between the economic and social needs of society on the basis of loans from private individuals, institutions of the non-state sector and foreign countries (Borzenko, 2018, p. 431).

Table 1 is continued on the next page

Continuation of Table 1

Author	Public debt is…
C. R. McConnell, S. L. Brue, S. M. Flynn	The total amount of all deficits and positive balances of the federal budget accumulated throughout the history of the country (McConnell, Brue & Flynn, 2014).
P. A. Samuelson, W. D. Nordhaus	The total amount of government debt in the form of bonds and short-term loans (Samuelson & Nordhaus, 2020).
J. R. Barro	The sum of state's debt securities, intended to finance a temporary lack of funds in the state budget (Barro, 2008).
A. M. Buti	The sum of all federal and local government loans, independent government agency loans, government company loans, and all liabilities to suppliers and manpower at the level of federal and local governments, independent government agencies, and government companies (Buti, 2020).
M. B. Adhikari	The total amount of financial resources which is borrowed by the government to meet out its budgetary deficit **(**Adhikari, 2020, p. 1**).**
O. K. Onyekachi, N. E. Chijioke	It is the aggregate amount of money that government owes either to their citizens, local financial or foreign financial organizations (Onyekachi & Chijioke, 2021, p. 93).

Source: prepared by the author.

According to the Budget Code of Ukraine, the public debt is the total amount of the state's debt obligations for the return of received and outstanding loans as of the reporting date, arising as a result of state borrowing (Budget Code: Article 1, 2010).

Based on the analyzed interpretations of the term "public debt", it is possible to form the following definition of this macroeconomic phenomenon: it is a set of financial instruments used to form relations between the state as a borrower with economic entities of the sectors of the country's economy, foreign economic entities, states, international organizations as creditors, which is characterized by the amount owed to creditors on a certain reporting date, time schedule of its repayment and maintenance.

The public debt includes the external public debt is the state's indebtedness to foreign citizens, states, banks and international financial organizations, and internal public debt - the indebtedness of the state to citizens, legal entities of this country that own securities issued by its government (Arutiunian, Dobrynina, & Krasilnikova, 2018, p. 167). When performing economic analyzes and forecasts by scientists and researchers, the concept of public debt also includes the amount of state-guaranteed debt. State-guaranteed debt is a set of financial instruments used to form relations between the state as a financial guarantor and domestic economic entities that have their outstanding debt obligations and the functioning of the guarantee reserve of budget funds in the event of the need to implement the provided state guarantee (Bosenko, 2019, p. 33).

According to the Ministry of Finance of Ukraine there are several structural components of the public debt according to its division into "internal" and "external" (see Table 2).

Table 2. Structural components of public debt of Ukraine

Components of internal public debt	Components of external public debt
1) Obligations to domestic natural persons and legal entities for repayment and maintenance of public debt securities.	1) Loans received from official government institutions (central banks/national governments); private banks; and international monetary and financial organizations (IMF and related international financial and credit organizations).
2) Obligations to banks and other legal entities under guarantees for granted loans.	2) External debt for all foreign state bonds.
3) Compensation of debts to business entities for Value added tax (VAT) refund.	3) Investment loans raised by economic entities under state guarantees.
4) The debt of the state for compulsory payments (payment of salaries in state institutions, pensions, scholarships and all other mandatory ones, which are provided for by the current legislation of Ukraine).	4) All long-term unguaranteed loans raised by non-state borrowers within their own development projects.
5) Indebtedness of the Cabinet of Ministers of Ukraine (CMU) to the National Bank of Ukraine (NBU) for loans granted and funds invested in government debt securities.	5) Related loans received within the framework of interstate and intergovernmental agreements.

Source: compiled by the author according to The Ministry of Finance of Ukraine, 2021.

Scientists identify the following key reasons for the formation and growth of the public debt (Iurii, 2017, p. 706):

- the need to expand expenses of the government in case of unchanging or decreasing of the state budget revenues;

- the work of automatic stabilizers in the periods of financial crises;

- the need to lower the tax burden unaccompanied by the subsequent decrease in the expenditures of the government;

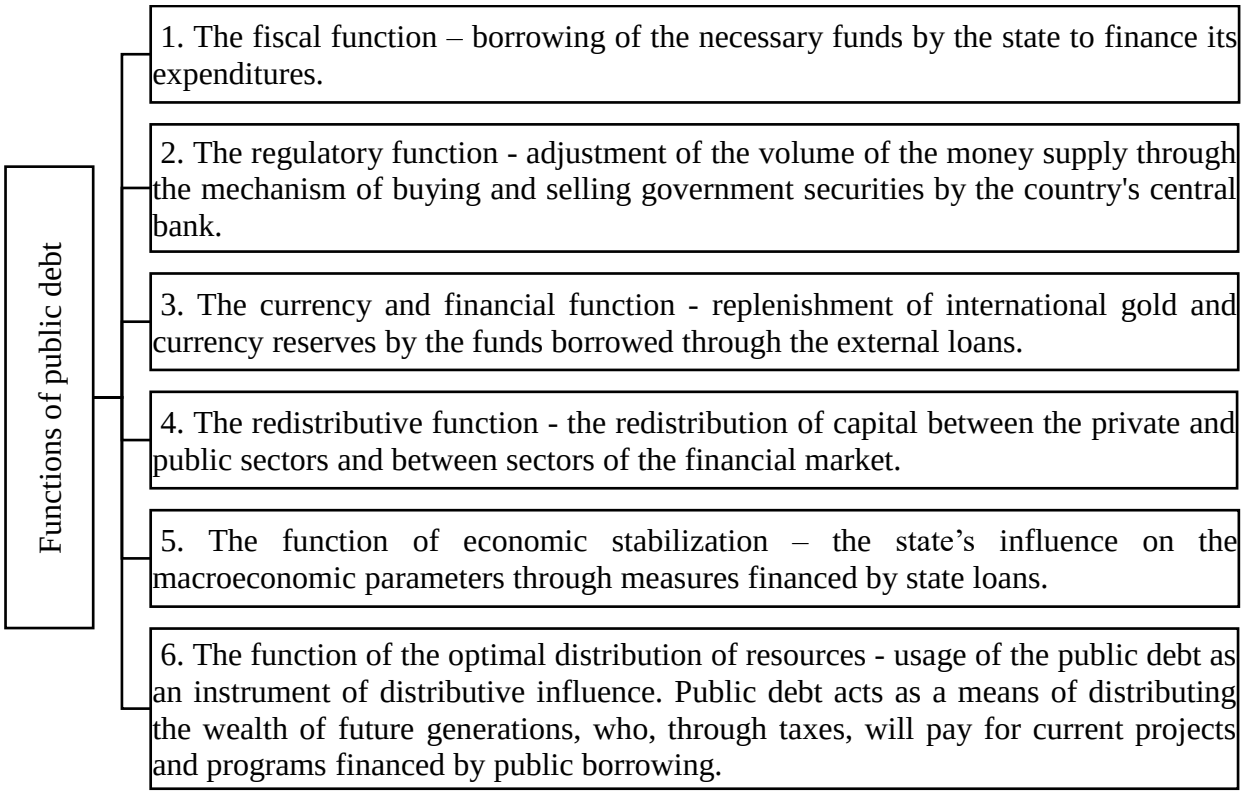
- the positive situation on international markets that allows to borrow funds at a low interest rate;

- “the emergence of debt risks, that can lead to a lack of the debt restructuring possibilities and the requirements for the additional borrowing” (Iurii, 2017, p. 706);

- the need to finance the elimination of consequences of natural or man-made disasters, wars, epidemics, natural disasters;

- the need to finance grounded or populistic political projects.

The importance of effective management of the public debt is determined by the main functions performed by the debt (see Fig. 1) (Semerenko & Savchenko, 2021, p. 260):



Source: compiled by the author according to Kucher, 2012.

Fig 1. Main functions of the public debt

Therefore, the study of the concept of public debt took place over a long period of time from the very beginning of the birth of economic thought and attracted the attention of a significant number of economists. Public debt is an extremely important macroeconomic phenomenon at the current stage of development of the world economy, which is determined by the functions it performs and its impact on the socio-economic development of the state.

1.2. Essence, methods and principles of the public debt management and its peculiarities in Ukraine

Public debt management and debt maintenance is one of the priority tasks of the state's financial policy, an important condition for the stability of its financial system and credibility. Effective management of the public debt at all its stages allows to avoid crisis debt situations and overloading of the expenditure part of the state budget in terms of public debt maintenance costs as well as accumulation of debt burden for future generations.

Nowadays, Ukrainian and foreign economists have defined the concept of public debt management from a structural and functional points of view (see Table 3).

Table 3. Definitions of the term "Public debt management"

Author	Public debt management is…
S. V. Oleksiychuk	A purposeful systematic process carried out by the responsible body: it involves a set of measures and procedures covering the actual state borrowing, use of borrowed funds, debt maintenance and repayment with the aim of overcoming the budget deficit, ensuring the economic stability and credibility of the state, achieving sustainable level of economic growth and innovative development **(**Oleksiychuk, 2017, p. 58**)**.
O. L. Shelest	A set of state measures for paying interest to creditors and repaying of loans, changing the conditions of already issued state bonds, determining the conditions and issuing of new state bonds (Shelest, 2017, p. 711).
Ye. O., Tsykaliuka, A. V. Sukhanova	A set of actions and measures related to preparation for issuance, placement of public debt obligations, provision of guarantees, as well as maintenance operations and debt repayment (Tsykaliuka & Sukhanova, 2016, p. 1).
R. Arindam, M. Williams	The complex process that includes the authorization of public debt issuance and the control of issuance limits in order to implement the set goal though different measures **(**Arindam & Williams, 2010**)**.
L. Beetsma	The process of developing and implementing a strategy for managing the government's debt in order to raise the necessary funds, meet risk and cost objectives, and achieve any other sovereign debt management goals the government may have set, such as developing and maintaining an efficient government securities market (Beetsma, 2022).
G. Wolswijk	A set of instruments and methods aiming to finance government debt at low medium-term costs against acceptable risks (Wolswijk, 2020, p. 2).
C. Singh	The process of executing a strategy for managing government's debt to raise the required amount of borrowings, pursue cost/risk objectives, and also meet any other goal that the government might have set (Singh, 2016).
M. N. Hanif	The process by which the government acquires and utilizes the debt efficiently and effectively for budgetary purposes keeping its objectives of debt management. It refers to the technical and institutional aspects of organizing the public debt (Hanif, 2002, p. 41-42).
T. Fujitani	The policy to strategically determine the composition of the debt stock and to implement that goal via a variety of measures (Fujitani, 2022, p. 2-3).

Source: prepared by the author.

Also, definitions of the nature of "Public debt management" were formed by international institutions, organizations and stated in the relevant laws, codes and other documents (see Table 4).

Table 4. Institutional definitions of the term "Public debt management"

Institution/Code	Public debt management is..
Budget Code of Ukraine	A set of actions related to borrowing, maintenance and repayment of public debt, other transactions with it, aimed at achieving a balanced budget and optimizing the debt burden (Budget Code of Ukraine, 2010, Article 1).
International Monetary Fund, The World Bank	The process of establishing and executing a strategy for managing the government's debt in order to raise the required amount of funding at the lowest possible cost over the medium to long run, consistent with a prudent degree of risk (IMF, 2014, p. 7).

Table 4 is continued on the next page

Continuation of Table 4

Institution/Code	Public debt management is..
Ministry of Finance of Japan	A set of actions while trying to mitigate fiscal burden, implements Japan Government Bonds issuance, distribution and redemption measures to allow government debts to be smoothly accepted at each stage of the national economy (Ministry of Finance of Japan, 2021).
United States Agency for International Development (USAID)	A set of actions to maintain the creditworthiness of the government while avoiding debt sustainability concerns (USAID, 2022, p. 20).

Source: prepared by the author.

Summing up the above, the following definition can be given to the concept of "Public debt management" - it is a complex of measures of state authorities, related to raising funds on the terms of state credit, their placement, repayment and maintenance, to ensure the state's macroeconomic stability while maintaining an acceptable and manageable level of risk.

The long-term goal of public debt management is to keep the growth of a country's debt within its maintenance capacity. The implementation of this goal allows to ensure compliance of borrowings with the general goals of macroeconomic policy and use the borrowed resources effectively. Public debt is managed on the basis of the formed Debt Policy.

Economists identify the following tactical tasks that are solved in the process of managing the public debt:

1) Finding of effective conditions for borrowing funds (minimizing the cost of the debt) and preventing inappropriate and inefficient use of borrowed funds;

2) Ensuring compliance with debt credibility indicators and preventing sharp fluctuations in debt market;

3) Ensuring timely and full payment of the principal amount and accrued interest, as well as determining the optimal ratio between internal and external borrowing;

4) Creating of a high-quality regulatory and legal framework as well as an effective system of accounting and control over the public debt (Oleksiychuk, 2017, p. 60).

Strategic tasks that are solved in the process of managing the public debt can be summarized as follows:

- Ensuring stable rate of economic development of the state, maintaining a safe level of inflation and stability of the exchange rate;
- Preventing the occurrence of a massive debt burden for future generations to maintain and repay;
- Maintaining a consistently high credit rating in both national and foreign currency (Oleksiychuk, 2017, p. 60).

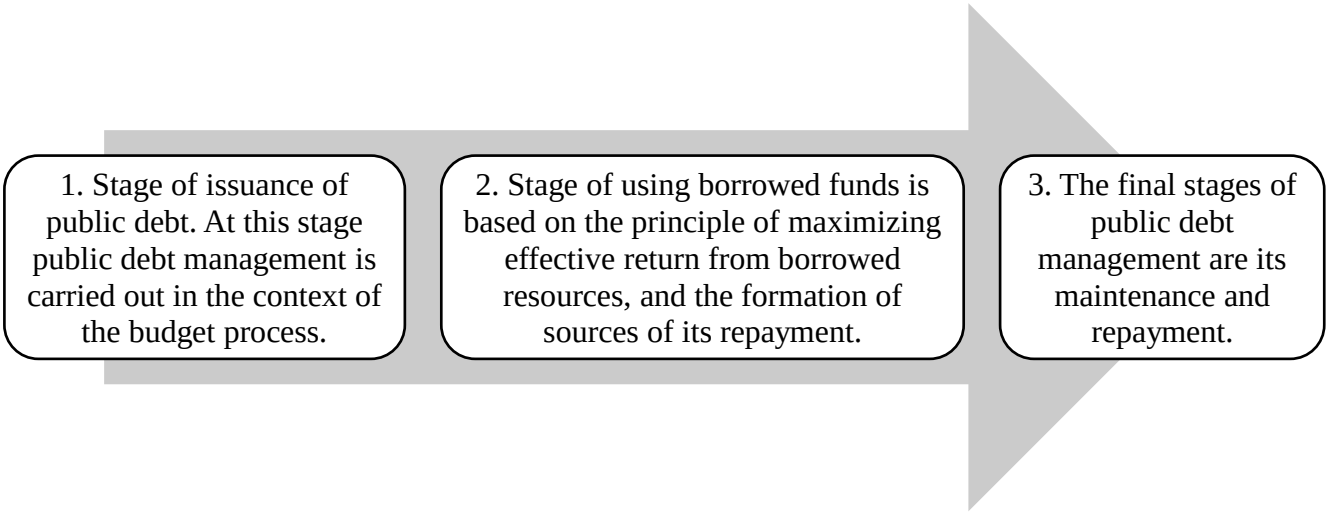
The principles of public debt management developed by domestic and international economists include (see Table 5):

Table 5. General principles of public debt management

Principle	Essence
Unconditionality	Provision of unconditional fulfillment by the state of all obligations to investors and creditors, which the state has assumed as a borrower.
Sustainability	Debt management should be anchored in sound macroeconomic and financial sector policies to ensure that the level and rate of growth in public debt are sustainable.
Preservation of financial independence	Maintenance of the optimal structure of the public debt, gradual replacement of external borrowings by internal ones.
Structure optimization	Maintenance of the optimal structure of debt obligations according to terms of rotation and repayment, smoothing of «peak payments».
Minimization of the cost	Usage of debt cost minimization including the early redemption of public debt obligations at a discount.
Risks minimization	Diversification and optimization of borrowing sources to reduce the impact of fluctuations in the global capital market and securities market on the government bonds market.
Transparency	Openness and full transparency of the all stages of borrowings, ensuring access of international rating agencies to reliable information on the economic situation in the state.

Source: compiled by the author according to De Moura Estevao Filho et al., 2021.

The process of the public debt management in general is divided into the 3 main steps (see Fig. 2).



Source: prepared by the author.

Fig. 2. Main stages of the public debt management

During the entire process of public debt management, control over the attraction and use of public loans is carried out (audit of the public debt; control over the targeted use of credit funds; evaluation of the effectiveness of public debt management; public disclosure of information on the public debt, etc.) (Tsykaliuk, & Sukhanova, 2016, p. 1).

In the scientific literature, the following public debt management methods are identified (Shelest, 2017, p. 712):

- Debt extension is a form of voluntary agreement of creditors to postpone payments on the liabilities of the debtors; it is used when it is not economically feasible to issue new loans to service previously offered ones.
- Debt consolidation - changing the terms of the loan regarding the time of its maturity (duration) with a possible change in the loan interest: the conversion of the loans with short-term maturity into long-term maturity ones, combining a few of previously issued government loans into one.
- "Partial or full cancellation of the debt - the government rejects to pay back its debt; cancellation of debts occurs in case of the economic instability of the country, or political reasons; this method is also relevant for the states with low level of economic development that are not able to pay back their debts even in the far future; partial writing-off of the state debt can be conditionally economically favorable for creditors too" (Shelest, 2017, p. 712).
- Debt conversion – changing the initial conditions of a state loan: a change in the terms of the loan, the time of payment, the method of repayment of the loan, and most often - a change in the loan interest (change in the loan yield).
- A temporary moratorium, declared by special actions of the state authorities, on the payment of interest or a portion of the principal of the debt: this deferral of internal or external debt obligations lasts for a certain period of time or until the end of specific extraordinary events.
- Debt buyout with a discount on the secondary market - reducing the public debt through the buyout of own debts with a discount on the secondary market. This method of debt restructuring can be carried out by the states that have significant amounts of liquid international reserves.
- Exchange of state bonds for shares of national enterprises or national currency: offering the right to creditors to sell government bonds for the national currency with a certain discount, for which, as a result, shares of national companies can be purchased or direct exchange (swap) of state bonds for shares of state-owned companies.
- "External debt restructuring organized through the framework of the Paris Club of Official Creditors and the London Club of Private Creditors" (But, Mamotenko, & Zaytseva, 2020, p. 85). During debt restructuring, both the principal amount of the debt and the terms of its maintenance are revised, and at the same time changes are made in the debt agreement conditions, so that the creditor confirms the certain relaxation of the terms of debt payments in favor of the borrower.

So, the various public debt management methods can be employed based on the specific political and economic situation as well as the projections for the public debt dynamics in the short-term and long-term periods.

Public debt is managed by various institutional units in different countries all over the world. Scientists distinguish three basic models of institutional regulation of public debt that are basis of the process of public debt management (see Fig. 3):

Government model

- The public debt is managed by government institutions, including the Ministry of Finance and the State Treasury. This model operates for example in Canada, Japan, Korea, Mexico, Norway and Poland.

Bank model

- The public debt is managed by the central bank. Examples of countries that use this type of the model are China, Denmark and Iceland.

Agency model

- The public debt management is carried out by a separate agency, which determines the volume and mechanisms of borrowing. Examples of such agencies were created in Sweden – Swedish National Debt Office; Austria – Austrian Federal Financing Agency; England - UK Debt Management Office.

Source: prepared by the author.

Fig. 3. Models of institutional regulation of public debt

Ukraine adheres to the government's model of public debt regulation. The State Treasury Service of Ukraine is responsible for making payments for repayment and maintenance (interest for the funds usage) of the debt, by order of the Government Commissioner for public debt management, which is part of the Ministry of Finance of Ukraine. The annual report is prepared based on the results of the reporting year, which is audited by Accounting Chamber of Ukraine at least once every three years.

Public debt management, is also classified depending on the management strategy as an addition to classification according to the model of institutional regulation (see Fig. 4):

Fiscal-oriented strategy	The main goal of management is to reduce the cost of external borrowing. According to such a strategy, the structure of the public debt is not a priority, the main place in the management is occupied by the terms of borrowings and their cost. Such a policy is called “economy of public expenditures”.
Neutral strategy	The key element of management is the terms of servicing loans with the benefit of debt restructuring. Under this strategy, the main task of management is to solve the issue of payment of current obligations, without paying full attention to the terms, structure and cost of borrowings. Such management is called a “survival” one.
Anti-cyclical strategy	The main goal of public debt management is to reduce the impact of world crises on the national economy and maximally restore economic processes in the country as well as prevent occurrence of massive debt burden on future generations. The strategy is characterized by the definition of priority management goals and promotion of their achievement, with an overview of the structure, terms, cost of issuing of the debt obligations.

Source: prepared by the author.

Fig. 4. Public debt management strategies

The neutral strategy for public debt management is inherent in Ukraine, taking into account the measures to manage and service the debt, as during the history of the public debt of Ukraine the main goal of the public debt management has been to constantly solve the problems of the maintenance and repayment of current debts as the credit rating is enormously important without fully taking into account the terms, structure and cost of borrowings. Such situation creates further problems in debt credibility of Ukraine.

According to the resolution of the Cabinet of Ministers of Ukraine (CMU) “On the Provisions on the Ministry of Finance of Ukraine”, in Ukraine, the management of public debt is carried by the Ministry of Finance of Ukraine within the limits of the powers defined by law of Ukraine (Ministry of Finance of Ukraine, 2021). The Ministry of Finance of Ukraine has developed a medium-term strategy for public debt management for 2021-2024. The basis of public debt management is to borrow at the lowest possible cost, considering the risks. So, four main goals of public debt management are defined:

- Increase in the share of public debt in the national currency.
- Extending the average term for debt repayment and ensuring a uniform repayment schedule of the public debt.
- Receiving long-term preferential financing.
- Continuation of development of strong relations with investors and further improvement of public debt management policy (Ministry of Finance of Ukraine, 2021).

The experts of the World Bank formed a definition of effective management of public debt. According to it, effective management of the public debt should include three processes: choosing a suitable type of financing, deciding on the amount of borrowing, and reporting on the state's debt. However, it would also be important to add strategic planning and monitoring of debt credibility indicators, which are crucial for making management decisions. Based on international practice, the Department of Economic Policy and Debt of the World Bank Group has Debt Management Performance Assessment Methodology (DMPAM), which is aimed at low- and middle-income countries. It creates the possibility to monitor progress in achieving the country's public debt management goals over a specified period of time in accordance with global best practice (De Moura Estevao Filho et al., 2021). To assess the effectiveness of public debt management, a set of six blocks is used, reflecting the elements necessary to ensure proper debt management practices:

1. “General principles of management: legal framework, debt management strategy, assessment of debt management operations.

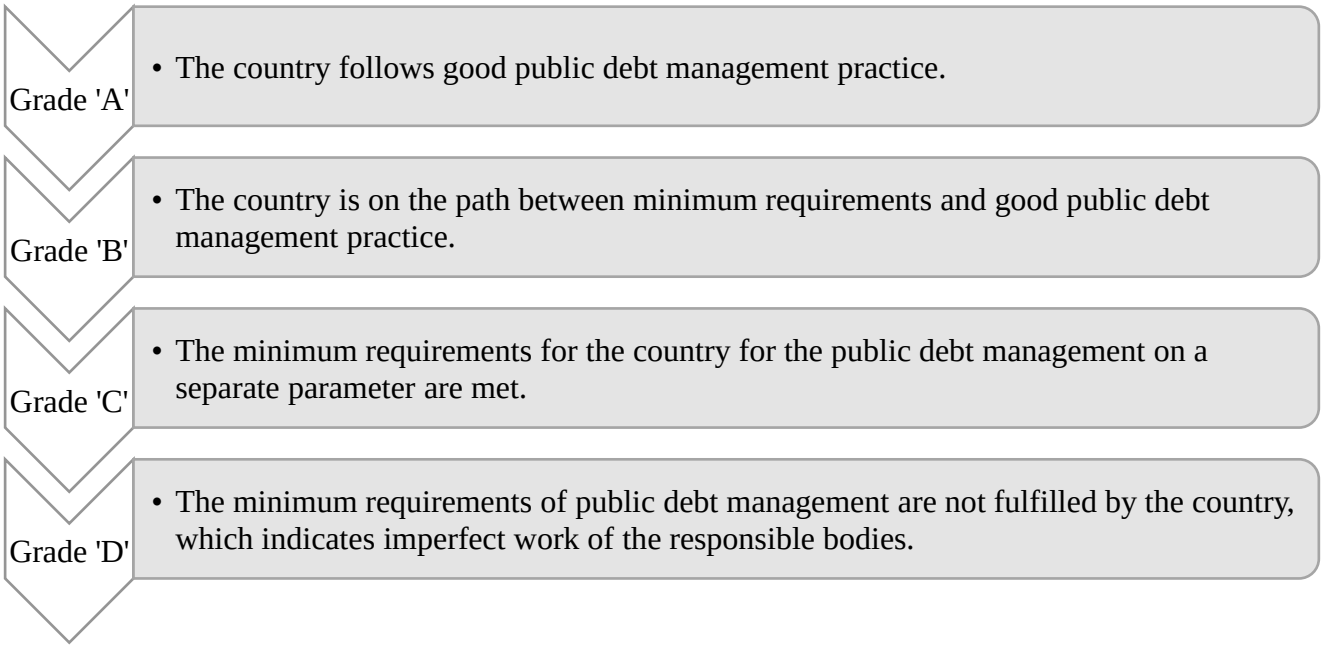
2. Compliance with macroeconomic policy: fiscal and monetary policy.

3. Borrowing and related financial activities: external and internal borrowing, loan guarantees, derivative financial instruments.

4. Cash flow forecasting and cash balance management.

5. Operational risk management: debt administration, business continuity, data credibility.

6. Accounting documents and reporting on the public debt. If the results of the assessment indicate non-fulfillment of the minimum requirements, it makes it possible to clearly define the directions in which reformation or capacity building should be carried out" (De Moura Estevao Filho et al., 2021). According to the methodology, each parameter is evaluated, and a score is assigned based on the established criteria (see Fig. 5):



Source: compiled by the author according to De Moura Estevao Filho et al., 2021.

Fig. 5. Evaluation grades for the process of public debt management

In turn, the main characteristics of the mentioned indicators include such elements as assessment parameters, key or minimum requirements for the specified parameter, as well as documents necessary for conducting the assessment itself.

In the process of public debt management, the calculation and forecasting of debt credibility indicators is carried out in order to ensure the sustainability of the public debt level and achieve the defined tactical and strategic tasks of debt policy.

In the monetary and financial sphere, the European Union (EU) Treaty (Maastricht Treaty) defines five convergence criteria, which relate to price stability, budget deficit, public debt, stability of the national currency and interest rates. There criteria include (European Central Bank, 2017):

1. The budget deficit to GDP ratio should not exceed 3%;
2. The public debt to GDP ratio should not exceed 60%;
3. Stability of prices and stability of average inflation rates during one year prior to the evaluation; the inflation rate cannot exceed by more than 1.5% to the corresponding indicators of the three best (from the point of view of price stability) EU member countries;

4. The long-term nominal interest rate should not exceed by more than 2% the corresponding indicators of the three best (from the point of view of price stability) EU member countries;

5. For at least two years, the deviation of the exchange rate should not exceed the limits stipulated by the European Exchange Rate Mechanism (ERM II), i.e. ±15% relative to the euro.

The identified criteria demonstrate the high level of interrelation and importance of coordination of public debt management with monetary and fiscal policies.

The set of indicators of the public debt credibility and sustainability level, that is adopted in the structured framework all over the world, consists of 3 main groups (see Table 6) (International Monetary Fund, 2014; Ministry of Finance of Ukraine, 2023).

Table 6. Indicators of the public debt credibility and sustainability level

The group of indicators	Indicators of debt credibility and sustainability	Norms, %	
		Ukrainian	International
Solvency indicators	Public debt to GDP ratio, %	≤ 60	≤ 60
	External debt to GDP ratio, %	≤ 40	≤ 25
	External debt to export ratio, %	≤ 150	≤ 70
	Internal debt to GDP ratio, %	≤ 30	≤ 30
	Public debt maintenance and repayment expenses to export ratio, %	≤ 20	≤ 25
Indicators of vulnerability of debt credibility	Public debt repayment and maintenance expenditures to the state budget ratio, %	≤ 25	≤ 25
	External debt to public debt ratio, %	≤ 50	-
	External debt maintenance payments to State budget expenditures ratio, %	≤ 10-15	≤ 10-15
	Public debt maintenance expenses to GDP ratio, %	-	≤ 5
	Average weighted yield domestic government bonds on the primary market, %	≤ 11	-
	Emerging Markets Bond Index (EMBI) + Ukraine, points	≤ 1000	≤ 1000
Debt Liquidity indicators	Official state gold and currency reserves to short-term external debt ratio, %	≥ 100	≥ 100
	Official state gold and currency reserves to External debt ratio, %	> 50	-
	Public debt to official state gold and currency reserves ratio, %	<500	<330

Source: compiled by the author according to International Monetary Fund, 2014; Ministry of Finance of Ukraine, 2023.

On the basis of calculated ratios, the Integral indicator of the debt credibility and sustainability level can be calculated using the specific weighted coefficients coherent with the Order of Ministry of Economic development of Ukraine “On the approval of Methodological recommendations for calculating the level of economic credibility of Ukraine” that was approved in 2013 as a recommendation for the calculation of the integral indicator of economic credibility of the state, part of which is debt

credibility and sustainability integral indicator (see Table 7).

Table 7. Integral indicator of the debt credibility and sustainability level weighted coefficients

Ratio	Coefficient
Public debt to GDP ratio, %	0,2195
External debt to GDP ratio, %	0,2214
Average weighted yield domestic government bonds on the primary market, %	0,1830
Emerging Markets Bond Index (EMBI) + Ukraine, points	0,1778
Public debt to official state gold and currency reserves ratio, %	0,1983

Source: compiled by the author according to Ministry of Economic development of Ukraine, 2013.

So, the most common characteristic of the process of formation and conducting a high-quality and effective management of public debt are:

- ✓ Orientation of all methods and instruments of public debt management on macroeconomic stabilization and structural transformations, formation of an economy adapted to functioning in the conditions of financial globalization, capable of ensuring balanced socio-economic development.
- ✓ Coordination of public debt management with fiscal and monetary policies.
- ✓ Compliance of the public debt management system with the principles of openness, transparency, predictability and responsibility.
- ✓ Development of relevant debt strategies, approval of government directives, as well as approval of annual financing programs and debt borrowing implementation plans.
- ✓ Effective placement of government securities, which are sold to both domestic and foreign investors, contributing to the diversification of risks.
- ✓ Formation of high-quality information support for management decision-making for optimal management of state obligations.
- ✓ Application of various methods of debt relief. Among them, the most common are conversions of debt obligations into shares, other securities with a discount from the face value or with a reduced interest.

1.3. Main macroeconomic factors influencing the public debt dynamics and its management in Ukraine

When developing and implementing public debt management measures, the responsible bodies and institutions take into account the main macroeconomic factors that determine the limits of

borrowings with the provision of an acceptable level of risk in order to achieve a health level of debt credibility. Therefore, in order to carry out an in-depth analysis of the public debt management system of Ukraine, it is necessary to investigate the essence of the main factors that influence decision-making regarding debt management and determine the dynamics of the amount of public debt. Such factors traditionally include the size of the state budget deficit, the official exchange rate of the national currency to the currency in which the largest part of the public debt is denominated, the amount of gold and currency reserves, as well as qualitative factors such as: natural disasters, wars, epidemics, catastrophes, financial crises etc.

According to the provisions of Article No. 1 of the Budget Code of Ukraine, the budget deficit is the excess of budget expenditures over its revenues (taking into account the difference between granting loans from the budget and returning loans to the budget). Nowadays, the State Budget of Ukraine experience a chronic deficit that is the key factor in the formation and increase of its public debt, which confirms the close connection between these macroeconomic phenomena.

The classification of types of budget deficit in Ukraine is presented as follows (Koliada & Kosmynina, 2018, p. 102):

- Open budget deficit is officially approved by the Law of Ukraine and a decision of local councils. Hidden deficit is not confirmed by laws or documents, but is later revealed due to an increase in revenues;

- Permanent deficit is one that is noted in the long-term period. Temporary one is counted due to temporary cash discrepancies (gaps) between expenditures and revenues that are formed at the time of budget implementation;

- Active deficit is formed when an increase in budget expenditures stimulates aggregate demand. The active budget deficit concentrates funds for investment in the economy, which contributes to the increase of GDP. A passive deficit is a deficit that is formed as a result of an “economic decline/fall”, when a decline in production and employment leads to a decrease in budget revenues and increase in expenditures;

- Forced deficit of the budget is associated with the need to spend more funds than it is possible to mobilize, and is also a consequence of natural disasters, epidemics, wars, devastation, economic crisis, etc. Unforced budget deficit arises as a result of inefficient financial-economic and budgetary-tax policy, as well as due to unqualified leadership and ineffective management system;

- External deficit of the budget is the difference between external expenditures and receipts from external sources. Internal deficit characterizes the excess of the total deficit over the external (Koliada & Kosmynina, 2018, p. 102).

There is a fairly close positive and justified relationship between the budget deficit and the public debt. The impact of the budget deficit on the public debt can be characterized as follows: the presence of a budget deficit stimulates the borrowing and use of state loans to cover the difference between the

revenues and expenditures of the state budget to eliminate the corresponding deficit, which ultimately leads to another problem - the formation of the public debt and its increase. The growth of the budget deficit has a direct negative effect, which generates an increase in the amount of the public debt of the country, and the growth of the public debt, in turn, requires additional budget expenditures for its maintenance and increases the budget deficit. This situation leads to the emergence of a cyclical “debt spiral” - interdependent growth of the public debt and budget deficit and appears due to poor public debt management and budget planning (Ianiv & Zinchenko, 2016, p. 150-151).

Nowadays, Ukraine covers its budget deficit through external borrowing (the main external creditors of Ukraine are such international financial and credit institutions as: the IMF (International Monetary Fund), the EU (European Union), as well as the World Bank), as well as governments of countries with a high level of economic development. The use of state borrowing to cover the state budget deficit is due to an increase in defense spending and the corresponding maintenance of the public debt.

The official exchange rate is the price of a currency unit of a certain country expressed in the currency unit of another country. In general, today there are two main modes of exchange rates: floating and fixed.

A fixed regime is when the central bank declares a certain exchange rate and makes a small corridor of fluctuations around this declared value of the foreign currency. The central bank does not intervene in the functioning of the foreign exchange market until the market rate goes beyond the corridor established by it. Then the Central Bank begins to sell foreign currency to the market (becomes on the supply side), which leads to a decrease in the size of gold and foreign reserves, or buys back surplus of foreign currency (becomes on the demand side) (Didur, Hlukhova & Yelisieieva, 2016, p. 339).

The free-floating regime of the exchange rate means that the level of the official exchange rate is determined exclusively on the foreign exchange market under the influence of supply and demand, which depend on the state of the country's balance of payments, the ratio of interest rates and inflation rates, expectations of market participants, official currency interventions, etc. The Central Bank does not intervene in the exchange rate formation process (Didur, Hlukhova & Yelisieieva, 2016, p. 339).

In most countries of the world, including Ukraine, a floating exchange rate regime is currently operating under conditions of inflation targeting. Under inflation targeting, the Central Bank makes decisions based mostly not on what is happening on the foreign exchange market, but on what the inflation forecast is.

Setting the exchange rate is called a currency quote. If the exchange rate reflects the price of a unit of foreign currency through the national currency, then there is a direct quote. Expressing the price of a unit of national currency in foreign currency units means reverse quotation. In Ukraine, direct quotation

of the foreign currency exchange rate is used from the 1996, when Hryvna was introduced as a national currency.

Since most of the total public debt of Ukraine is denominated in foreign currency, namely the US dollar, this factor is closely related to the dynamics of the total amount of public debt.

When managing public debt in Ukraine, one of the most important forecasted macroeconomic indicators is the official exchange rate of the hryvnia against the US dollar. This is explained by the significant dependence of the dynamics of the national debt of Ukraine on the official exchange rate. The devaluation of the national currency negatively affects the amount of resources needed to repay and maintain the public debt, leads to an increase in indebtedness, a decrease in the NBU's gold and currency reserves as well as reduction in money in circulation, and, in the final case, a debt crisis. The strengthening of the national currency in relation to the foreign currency ensures a cheaper maintenance of the foreign currency -denominated debt and its total volume, while, at the same time, making it more difficult to service the domestic public debt. However, taking into account the peculiarities of the Ukrainian economy, namely the underdeveloped financial market, the presence of significant negative externalities, such as a full-scale war and loss of export earnings, the devaluation of the national currency has a more negative effect on the management of the public debt than the strengthening of it (Iurii, 2017, p. 706).

The next factor that affects the dynamics of the public debt is the official amount of the state's gold and currency reserves (international reserves).

According to the Law of Ukraine “On the National Bank of Ukraine”, gold and foreign exchange reserves are reserves of Ukraine reflected in the balance sheet of the National Bank of Ukraine, which include assets recognized by the world community as international and intended for international settlements **(**Law of Ukraine “On the National Bank of Ukraine”, 1999, Article 1).

In modern conditions, the structure of official gold and currency reserves formed by the central banks of the majority of countries all over the world includes, as a rule, four main components:

1) Foreign currency;

2) Reserve position in the IMF;

3) Special Drawing Rights (SDR);

4) Gold reserve (monetary gold)**.**

According to the currently adopted Ukrainian legislation (Article 47 of the Law on the National Bank of Ukraine), gold and foreign reserves in Ukraine have the following asset structure:

- Monetary gold;
- Special Drawing Rights;
- Reserve position in the IMF;
- Foreign currency in the form of banknotes and coins or funds in accounts abroad;

- Securities (except shares) that are payable in foreign currency;

- Any other internationally recognized reserve assets, provided that their credibility and liquidity are ensured**.**

Only the National Bank of Ukraine has the right to use gold and currency reserves in Ukraine for the following purposes: to service the country's foreign debt both to government institutions and financial structures of other states and international financial organizations; with the aim of maintaining exchange rate stability by conducting interventions on the foreign exchange market; covering the balance of payments deficit; to ensure the solvency of the state; implementation of international settlements and payments **(**Law of Ukraine "On the National Bank of Ukraine", 1999, Article 1).

The relationship between the official amount of gold and foreign exchange reserves and the dynamics of the volume of public debt is quite close. In general, when the amount of gold and foreign exchange reserves decreases, it becomes necessary to replenish them to ensure 3 months of future critical imports and general stability in the financial system by attracting the NBU foreign currency funds from international financial organizations, central banks of foreign countries and other creditors. This increases the amount of the public debt in the short-term period.

It is also possible that with a sufficient amount of reserves, the Public debt also increases due to:

- the state's confidence in the sufficiency of its own reserves to cover possible risks that may occur;

- the need for significant resources for certain investment projects or to cover significant negative random factors;

- the existence of a favorable situation on the debt markets, as well as a positive credit rating - due to the stability of the financial system, which is ensured by foreign exchange reserves, which allows borrowings at a low interest rate.

Qualitative factors influencing the amount of public debt include:

1. Global financial crises, which has a significant influence on increasing of the cost of raising funds for developing countries with medium and low credit ratings, falling of the total amount of available resources for borrowing, and shortening of the credit terms. There is a reduction in economic activity and a decrease in tax revenues with the simultaneous need to rise the expenditures to smooth out the negative effect of this economic cycle, which leads to an increase in the budget deficit, that is financed by the increase in the amount of the public debt.

2. Epidemics and pandemics affect export-import operations and supply chains, reducing export earnings and increasing the cost of imports for some countries. It also causes the shutdown of enterprises and an increase in the level of unemployment in countries around the world, a decrease in tax revenues for state budgets and growth in medical expenses, which leads to rise in the amount of public debt to support the labor market, medium and small enterprises, and cover deficits in state budgets (Hapieieva, et al., 2022, p. 532).

3. Energy prices increase. For countries dependent on energy imports, the gap between export revenues and import costs grow in these conditions, which creates the need for additional borrowing to cover the trade deficit (or gold and foreign reserves that were previously used to finance the trade deficit). Also, the need for state support for price-dependent sectors of the economy and the reduction of tax revenues from them significantly affects the growth of the public debt (Gargouri, & Keantini, 2016, p. 120).

4. Natural disasters and man-made disasters destroy economic systems, infrastructure and life support systems of the region or the country as a whole, cause the need for significant costs for the restoration of infrastructure and all systems, as well as payments to affected individuals and legal entities. This situation creates a significant burden on the budgets of various levels and a corresponding increase in the volume of state and state-guaranteed debt (as state-owned enterprises can also suffer from such a situation).

5. International conflicts and wars cause a devastating effect on the general economic system of a state or a group of states, affect migration processes, influence on the growth of spending on security and defense, increase the cost of servicing the public debt and the budget deficits at various levels as a result. All of this will ultimately lead to a significant growth of the amount of public debt.

In general, in the process of managing of the public debt, it is extremely important to analyze the main macroeconomic factors that affect the dynamics of public debt. The analysis of such indicators and the formation of their forecast values is stated in the debt policy and strategy of the state, which are the basis for decision-making in the process of implementing measures for the management of public debt. The strength and nature of the influence of macroeconomic indicators on the dynamics of public debt should also be taken into account, because in order to ensure the implementation of effective and optimal management measures, special attention should be directed to the most influential factors. Appropriate analysis and forecasting of the main macroeconomic indicators ensure the fulfillment of one of the most important conditions for quality management of the public debt - coordination with the monetary and fiscal policy of the state in order to ensure its stable socio-economic development and health level of debt credibility.

2. METHODOLOGY

Research methods are the methods by which the research of a subject or topic is conducted. Research methodology explains the methods which are used for the research purposes (Goundar, 2012).

The methodological basis of the research is general scientific methods and special methods of scientific knowledge (Goundar, 2012). A systematic approach to their application makes it possible to conduct a systematic analysis of the public debt management in Ukraine.

The research is grounded on the debt credibility and sustainability framework, designed by the IMF and World Bank in 2005, which is used to assess countries' debt sustainability and offer policy recommendations to both debtor countries and creditors (The World Bank, 2023) as well as Ministry of Economic development of Ukraine and Ministry of Finance of Ukraine approved methodology for debt credibility and sustainability level of the state. The Integral indicator of the debt credibility and sustainability level is calculated based on the developed by the Ministry of Economic development of Ukraine methodology (Order of Ministry of Economic development of Ukraine "On the approval of Methodological recommendations for calculating the level of economic credibility of Ukraine", 2013) as well as proposed by the author methodology with normalization and equalization of parameters.

Research Type: This study will adopt a mixed-methods research design, incorporating both quantitative and qualitative research approaches. Quantitative research is based on the measurement of quantity or amount: the process is expressed or described in terms of one or more quantities (Goundar, 2012). The quantitative method of research emphasizes the measurement and analysis of causal relationships between variables, not processes (Booth, Colomb, & Williams, 2008). Qualitative research is concerned with qualitative phenomenon involving quality. Qualitative research approach is one whereby an emphasis is laid on procedures, which are not measured in terms of quantity. It is non-numerical, descriptive, applies reasoning and uses words. Its aim is to get the meaning, feeling and describe the situation (Goundar, 2012). The mixed-methods research approach is used for the research as better suited for the study of public debt management in Ukraine due to the complexity of the topic, the need to explore both quantitative and qualitative aspects, and the potential policy and practice implications of the research. It allows for a deeper and more nuanced understanding of the dynamics involved in managing of public debt.

The geography of this research encompasses Ukrainian macroeconomic system as the primary focus, with recognition of the country's financial conditions and peculiarities as well as its engagement in international economic dynamics. This scope allows for a comprehensive examination of public debt management in Ukraine.

The research consists of two main elements:

- descriptive research that is aimed to describe the current condition of the public debt dynamics

and its management in Ukraine as well as to provide systematic information about public debt phenomenon;

- correlational research aiming to determine the strength, extent and nature of a relationship between the public debt dynamics as % of Gross Domestic Product, state budget deficit amount as % of GDP, currency exchange rate of hryvna to US dollar, official amount of reserves of foreign exchange and gold (international reserves) as % of GDP.

Data collection. For the research purposes the following quantitative and qualitative data are collected for the period from 2009 to 2022 in order to analyze the period of economic and social reforms after the global financial crises and of the Ukrainian route to the European Union integration under the signed Association.

Quantitative data:

1) Historical and current data on Ukraine's public debt (Total debt levels, both internal and external. Debt composition, national and foreign currency-denominated debt, the types of creditors and public debt maintenance payments.

2) Macroeconomic Indicators: Relevant macroeconomic data that have impact on public debt dynamics (Current amounts and dynamics of official exchange rate, state budget deficit, official amount of reserves of foreign exchange and gold).

Qualitative Data:

1) Official government reports, policy documents, and international agreements related to public debt management in Ukraine (debt management strategies and policies, agreements with creditors, reports on debt sustainability and fiscal policies).

Data Analysis. For the research purposes the following quantitative and qualitative analysis is done:

Quantitative Analysis:

- Regression and correlation analysis is conducted to examine relationships between public debt and macroeconomic variables in order to identify significant correlations and nature of relationships.
- Descriptive Analysis is used to describe and investigate the current trends and patterns in public debt dynamics. The turning points, cycles, and long-term trends in debt accumulation are identified.
- Debt Sustainability Analysis (DSA): The established debt sustainability frameworks used by the IMF and World Bank are implied to evaluate the sustainability of Ukraine's public debt.

Qualitative Analysis:

- Systematic Content Analysis and Document Review is used to scrutinize policy documents and agreements to trace the evolution of debt management policies in Ukraine; identify shifts in strategies, changes in debt composition, and policy implications.

Information basis. The information base of the research is legislative and regulatory acts on the

management of the public debt and the development of the system of public debt in Ukraine. Official data sources of the research are: the Ministry of Finance of Ukraine, the National Bank of Ukraine, the Accounting Chamber of Ukraine, the State Statistics Service of Ukraine, International Monetary Fund, World Bank, European Bank for Reconstruction and Development and others.

The following methods are used when conducting the thesis research:

1. Statistical and historical methods are used to analyze the dynamics of the public debt of Ukraine and main influencing macroeconomic indicators during the period of the development of the Ukrainians economy.

2. Methods of scientific abstraction and systematic analysis are used to substant the concept of the public debt management and determining public debt indicators with determination of the level of Ukrainian debt sustainability.

3. Correlation method that reflects the strength and/or direction of the relationship between two (or more) variables and utilized while building econometric model (Rajasekar & Verma, 2013) is employed in research. It is used in order to identify and evaluate the nature and strength of the influence of the microeconomic factors on the dynamics of the public debt of Ukraine.

4. The method of comparison is used in comparison of the views of scientists regarding the essence of the public debt and its economic role, the essence and process of public debt management, as well as a comparison of the characteristic features of the correlation relationship between public debt and macro-financial indicators.

5. Structural analysis is a method of studying the characteristics of a hierarchically ordered system by identifying subsystems and elements of different levels in it and determining the relationships and connections between them (Mokin, & Mokin, 2015). It is used in the analysis of the public debt structure in Ukraine according to its division into internal and external debt.

6. Methods of tabular and graphic analysis and modeling are used to visualize statistical data, dynamics and calculations in the form of tables and graphs related to the public debt and macro-financial indicators (all the tables and figures given in the master's thesis are presented using these methods).

7. Methods of deduction and logical generalization are used in the process of drawing conclusions about a certain element of research (which is done on the basis of knowledge of the general properties of the object of research), as well as for the purpose of combining individual parts of the object of research into a single whole. The conclusions as well as based on the research results recommendations are constructed with employment of these methods.

Theoretical studies of domestic and foreign economic thoughts on the issues of effective management of public debt, determination of debt policy priorities, and the influence of public debt on ensuring the stability of the state's financial system are widely used. This approach provided an

opportunity to conduct the comprehensive systemic analysis of the public debt management condition in Ukraine on the basis of logical argumentation, comparison, econometric modeling and generalization.

The integration of data in the research involves a cross-referencing of quantitative and qualitative findings. Triangulation is employed to identify areas of convergence and divergence between the two data types. The integration of quantitative and qualitative data enhances the validity and depth of the research findings, providing a more holistic understanding of public debt management in Ukraine. The triangulation of data sources and methods contributes to the reliability of this study.

The analysis of the public debt of Ukraine is based on the Ordinary Least Squares regression (OLS) that is: «A common technique for estimating coefficients of linear regression equations which describe the relationship between one or more independent quantitative variables and a dependent variable» (Montgomery, Peck, & Vining, G. G., 2021). The multiple linear regression model will be constructed for the research purposes.

The multiple regression model equation is (Rencher, & Schaalje, 2008):

$Y = b_0 + b_1x_1 + b_2x_2 + ... + b_px_p + \varepsilon$, where

- 'Y' is the predicted or expected value of the dependent variable;
- 'x_1' through 'x_p' are p distinct independent or predictor variables;
- 'b_0' is the value of 'Y' when all the independent variables ('x_1' through 'x_p') are equal to 0;
- 'b_1' through 'b_p' are the estimated regression coefficients. ach regression coefficient represents the change in Y relative to a one unit change in the respective independent variable;
- 'ε' is the residuals (the error term of mean 0 which describes the variations of Y not captured by the model, also referred as the noise) (Rencher, & Schaalje, 2008).

The multiple regression model main assumptions are (Montgomery, Peck, & Vining, G. G., 2021):

1. Linearity: The relationship between the dependent variable and independent variables is linear.
2. Independence of Errors: Residuals are independent of each other, with no autocorrelation.
3. Homoscedasticity: The variance of residuals is constant across all levels of independent variables.
4. Normality of Residuals: Residuals are normally distributed.
5. No Multicollinearity: There is little to no multicollinearity among independent variables.
6. No Exact/Strict Linearity: No perfect linear relationships exist among independent variables.
7. Normally Distributed Errors: The errors themselves (not just residuals) follow a normal distribution.
8. No Outliers: There are no significant outliers in the data (Montgomery, Peck, & Vining, G. G., 2021).

Monitoring and addressing violations of these assumptions is essential for valid regression results, that is why the model will be checked on the existence of such negative features as autocorrelation, multicollinearity and heteroscedasticity.

Research instruments and environment.

Quantitative Data Analysis Software:

- Quantitative analysis of public debt data and economic indicators is done through Microsoft Excel - 2011 (software program by Microsoft that utilizes spreadsheets, formulas, and functions).

- The systematic correlation analysis and evaluation of the statistical significance of the constructed econometric model are carried out using the Gretl program – version 2023a (cross-platform software package designed for econometric analysis).

- Qualitative Data Analysis Software: MAXQDA – version 11.1 (software program designed for computer-assisted qualitative and mixed methods data, text and multimedia analysis) is used for the documents systematization analysis regarding public debt of Ukraine.

- Data Visualization Tool: Microsoft Excel – 2011 is used in order to create charts, graphs, and visual representations of the quantitative findings.

Data limitations. A time lag exists in the availability of the economic and financial data. Delayed data updates may restrict our ability to provide real-time analyses of economic trends and their impact on public debt dynamics. Public debt data and macroeconomic indicators are obtained from various sources with differing reporting standards and definitions. The heterogeneity of data sources may introduce measurement errors and complicate harmonization efforts. Despite presence of these limitations, the conducted study aims to provide valuable and sound research result on the public debt management in Ukraine.

Validity and Reliability. For qualitative research part of the study data collection instruments are pretested to make certain that they are appropriate for the study. This is achieved by scrutinizing and corroborating outcomes by carrying out content and bibliographic data analysis from the reliable sources. All steps undertaken in the usage of the instruments are recorded in details. For quantitative research part of the study, the analysis will ensure the validity of the instrument by the use of literature review on previous studies on good indicators and measurements for a face validity and the secondary data analysis from the official government and non-government resources. The combination of data types (both qualitative and quantitative) enhances the validity of the research. Quantitative data provide statistical evidence, while qualitative data offer depth and context. The convergence of evidence from both sources strengthens the overall validity of the study.

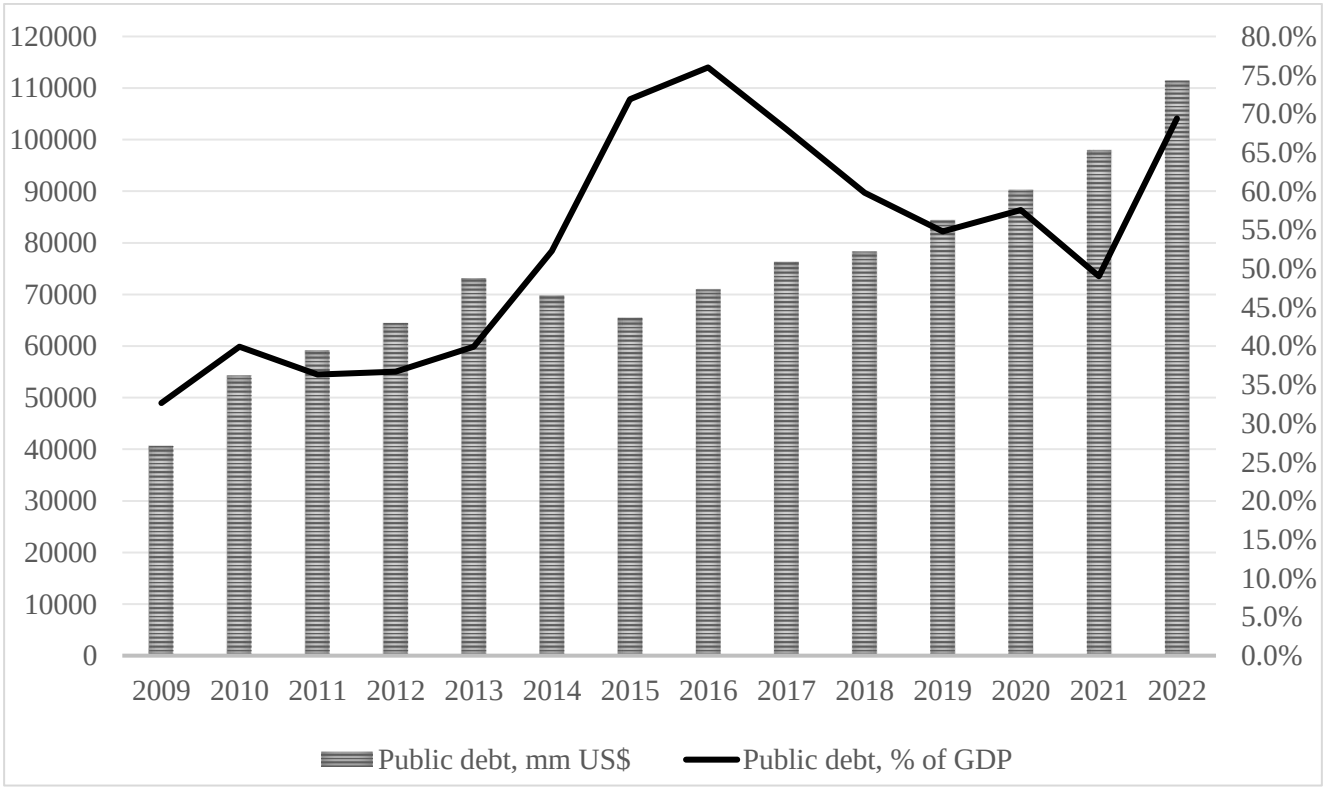
Based on the employed methods and analyzed results the relevant conclusions and practical recommendations are formed.

3. EMPIRICAL EVALUATION OF PUBLIC DEBT MANAGEMENT IN UKRAINE

3.1. Complex analysis of the structure and dynamics of the public debt of Ukraine

The high level of debt burden and the unstable dynamics of the public borrowings have a negative impact on the conditions of Ukraine's economy and its macro-financial position over the past 14 years. It is possible to realize the full potential of Ukraine's economy only under the condition of effective and systematic management of public debt, which should be implemented based on in-depth analysis of its dynamics, structure, and main trends.

During 2009-2022 the dynamics of the total nominal amount of the public debt has a steady upward trend, in the studied period its size increased by 174% and at the end of 2022 this macroeconomic indicator reached the total volume of 111.4 billion of US$ (see Fig. 6). So, the total nominal amount of the Ukrainian public debt reached its maximum in 2022 within the analysed period, that can be explained by the enormously high need in additional resources to stabilize the economy and finance the defence sector in order to confront the full-scale war with Russia Federation.



Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 6. Dynamics of the public debt of Ukraine for 2009-2022

On the other hand, the dynamics of the size of the public debt as a % of GDP is not so stable. During the analysed period, this indicator reached its greatest relative value of 76% of GDP in 2016. In general, from 32.5% relative to GDP in 2009, the total amount of debt grew to 69.4% in 2022 (see Fig. 6).

The dynamics of the total amount of public debt can be periodized and explained based on the following stages:

- the period of post-crisis recovery in 2009-2010, required significant involvement of financial resources in order to stimulate the Ukrainian economy. Frequent changes in government leadership created uncertainty, affecting debt management and economic stability;

- the stabilization of the economy of Ukraine in 2011-2013, which characterized by the increase in GDP, export operations and permanent maintenance of the safe levels of the public debt by the government. Ukraine pursued debt restructuring to decrease its debt burden during this period;

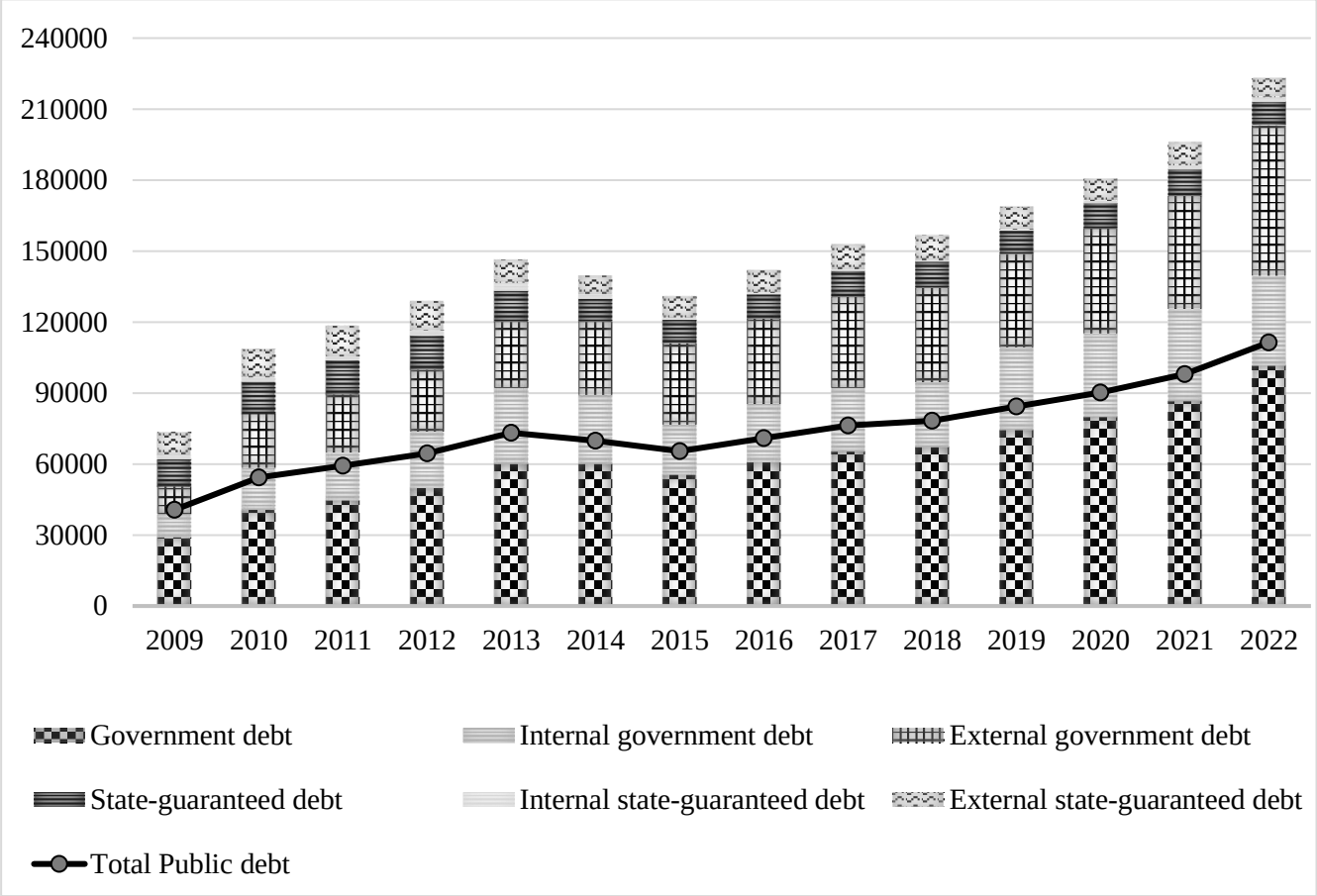
- the beginning of Russia's hybrid aggression in 2014, when the macroeconomic situation in the country deteriorated significantly due to absolute unpreparedness for this kind of conflict, which caused the need for public borrowing to increase budget expenditure for the security and defence sector, as well as provide financial help and social protection for refugees and unemployed people. During 2014-2016 period the yearly average US$ exchange rate to national currency increased by 220%, which was the biggest and the most dramatic fall in the history of Ukrainian Hryvna (UAH) exchange rate, the GDP of Ukraine in the US$ equivalent decreased by 50.3%;

- the period of economic reforms in 2017-2021, which became the basis for the return of the public debt level indicator below the established by Ukrainian government standards - 60% of GDP. Throughout this period, Ukraine's primary focus was on stabilizing its debt levels and fostering economic reform to maintain fiscal responsibility while navigating economic challenges such as ongoing hybrid conflict with Russia and COVID-19 pandemic;

- the beginning of a full-scale invasion of Russia on the territory of Ukraine in 2022, which became one of the biggest challenges for the Ukrainian economy in the entire history of its independence. However, it should be noted that the size of the state debt during such an extraordinary event increased from 49% of GDP in 2021 to 69.4% of GPD which is less than from 39.9% in 2013 to 76% in 2016 due to greater preparedness of the state, adoption of the number of socio-economic reforms and the financial support from the partner countries and financial institutions in the form of grants and credits that helps to ensure better stabilization of national currency exchange rate and to minimize the gap in the balance of payments. In 2022 the financial support from the partner countries and financial institutions was the main reason of the smaller reduction of 19.7% in GDP in US$ equivalent comparing to the sharp decrease of 50.3% in 2015 (see Annex 1).

Continuing the evaluation of the public debt of Ukraine, it is important to focus on the assessment

of its structure in order to identify the dynamics of changes in its main structural parts (see Fig. 7).



Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 7. Structure of the Public debt of Ukraine in 2009-2022, mm US$

In the general structure of the public debt of Ukraine during 2009-2022, the largest share is occupied by the government debt itself (see Fig. 7). The share of government debt in the total structure reached its maximum of 91.2% in 2022 (see Table 8). Since 2009, the structural value of state debt has had a steady upward trend. The size of the state-guaranteed debt continuously decreased during the period under study. The average share of state-guaranteed debt in the total structure is 16.7% during the analyzed period, with the maximum value of 28.4% in 2009.

There are set of important factors contributed to the decrease of Ukraine's state-guaranteed debt as a percentage of the overall public debt from 2009 to 2022. First, the permanent faster grow of the state debt part in the total structure of the public debt. Second, the decline in government's willingness to offer guarantees, especially for high-risk businesses due to importance of maintaining stable state’s international financial position in order to borrow on market average rates. Third, obtaining state guarantees for entities became more difficult due to tougher legal and regulatory frameworks. Moreover, organizations in Ukraine looked for new financing sources, such global markets or private investors, to lessen their reliance on state-guarantees. Finally, the number of entities controlled and ruled by the

government were permanently decreasing during the period of analysis that leads to the less need in state-guarantees for borrowing of such companies (Hantsiak, 2022).

During 2009-2022, the share of external state debt has always exceeded the share of internal one. In the period under analysis the average value of the share of external state debt in the total structure of the public debt is 46.8%, the maximum value of 57.1% was reached in 2022. The average share of internal state debt during 2009–2022 is 36.5%, this indicator reached its highest value of 43.9% in 2013 (see Table 8).

Table 8. Main structural elements of the public debt of Ukraine, % of public debt

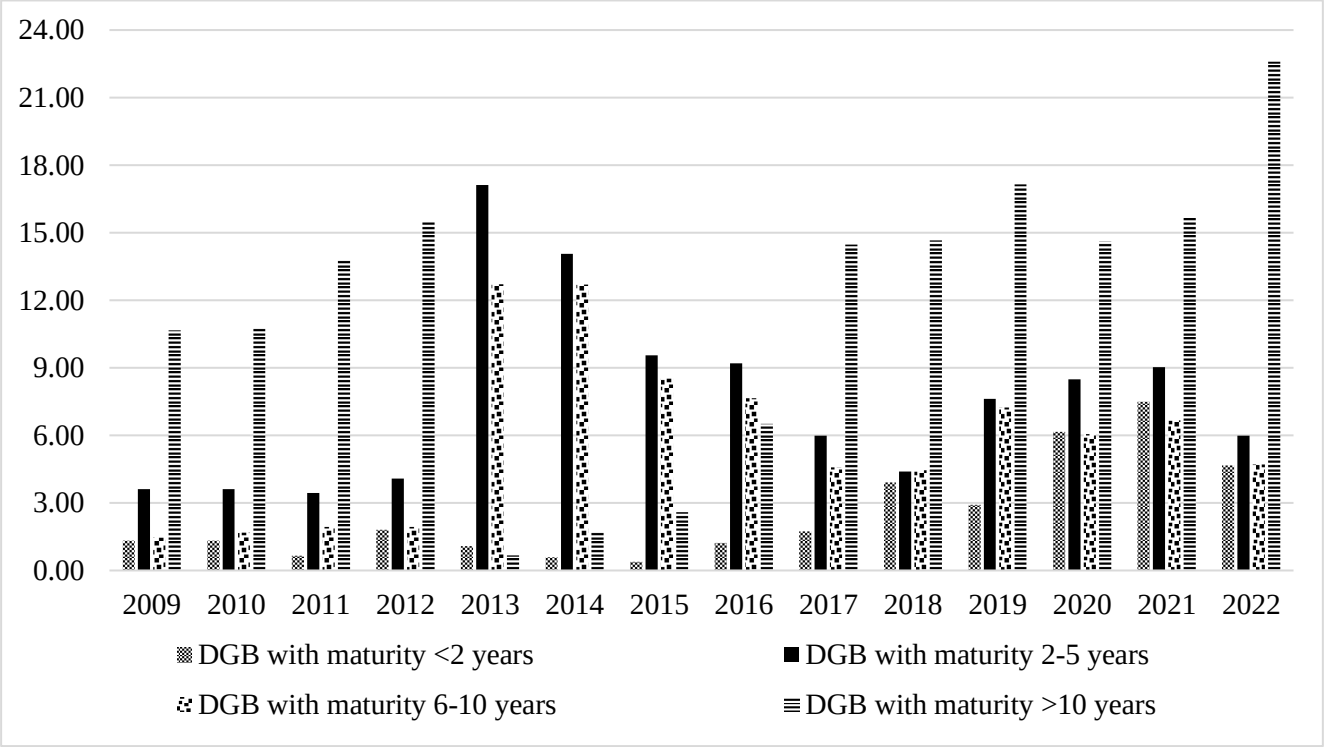
	State debt	Internal state debt	External state debt	State-guaranteed debt	Internal state-guaranteed debt	External state-guaranteed debt
2009	71.6%	28.7%	42.9%	28.4%	4.4%	23.9%
2010	74.8%	32.8%	42.1%	25.2%	3.2%	22.0%
2011	75.5%	34.1%	41.4%	24.5%	2.6%	21.9%
2012	77.4%	36.9%	40.5%	22.6%	3.1%	19.4%
2013	82.1%	43.9%	38.2%	17.9%	4.6%	13.2%
2014	86.0%	41.9%	44.2%	14.0%	2.5%	11.4%
2015	84.9%	32.3%	52.5%	15.1%	1.4%	13.8%
2016	85.5%	34.8%	50.8%	14.5%	1.0%	13.5%
2017	85.6%	35.2%	50.4%	14.4%	0.6%	14.1%
2018	85.8%	35.1%	50.7%	14.2%	0.5%	13.7%
2019	88.1%	41.5%	46.6%	11.9%	0.5%	11.4%
2020	88.5%	39.2%	49.3%	11.5%	1.3%	10.2%
2021	88.4%	39.8%	48.7%	11.6%	1.8%	9.7%
2022	91.2%	34.1%	57.1%	8.8%	1.8%	7.1%

Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

The dynamics of the share of internal and external state debt is not stable during 2009-2022. From 2009 to 2010 the decrease in share of external state debt can be noticed (see Table 8). This dynamics is a result of reduction in the amount of borrowing from the international financial institutions and grow in the internal businesses and citizens' investment in domestic government bonds due to fixed foreign currency exchange rate and higher interest rates comparing to other European countries. In 2011-2013, as a result of economic stabilization and the return of citizens' and businesses' trust in the Ukrainian economy, it became possible to replace a part of external borrowings with internal, which reduced the interest rate and currency risks of the public debt. At the same time, ineffective and weakly coordinated actions of the government caused the need to use a significant amount of international reserves to stabilize the exchange rate in order to increase the attractiveness of domestic borrowing, as well as to repay external debt. Insufficiency of public debt management, as well as the beginning of Russia's hybrid aggression, led to a sharp increase in the quota of external debt up to 52.5% of the total amount of public debt in 2015. The period of economic reforms and the gradual stabilization of Ukraine's economy created

opportunities to reduce the share of external debt in the total structure to 46.6% in 2019 (see Table 8). The beginning of the global pandemic and the need to increase the funding of the health care sector affected the growth of the share of external debt up to 49.3% in 2020. In 2022 the quota of external state debt in the overall structure reached its highest value due to the beginning of the full-scale invasion of Russia on the territory of Ukraine and related economic challenges.

During 2009-2022, it is possible to note the great fluctuations in the amounts of issued domestic government bonds which took the biggest share in the structure of the internal state debt (see Fig. 8). In the period of the post-crisis recovery (2009-2012) the major part of the domestic bonds market was dominated by the long-term government securities with the maturity of more than 10 years. During the economic and political instability period (2013-2016) mid-term domestic government bonds took the biggest quota on the internal market due to changes in maturity of previously issued government securities and newly issued ones with shorter period due to unfavourable interest rates (see Fig. 8). From 2017 due to adoption of the public debt management policy the share of long-term government securities has a clear upward trend showing the adherence to the goal of increasing the stability of the debt market and a result of the decrease in the level of interest rates in the economy.

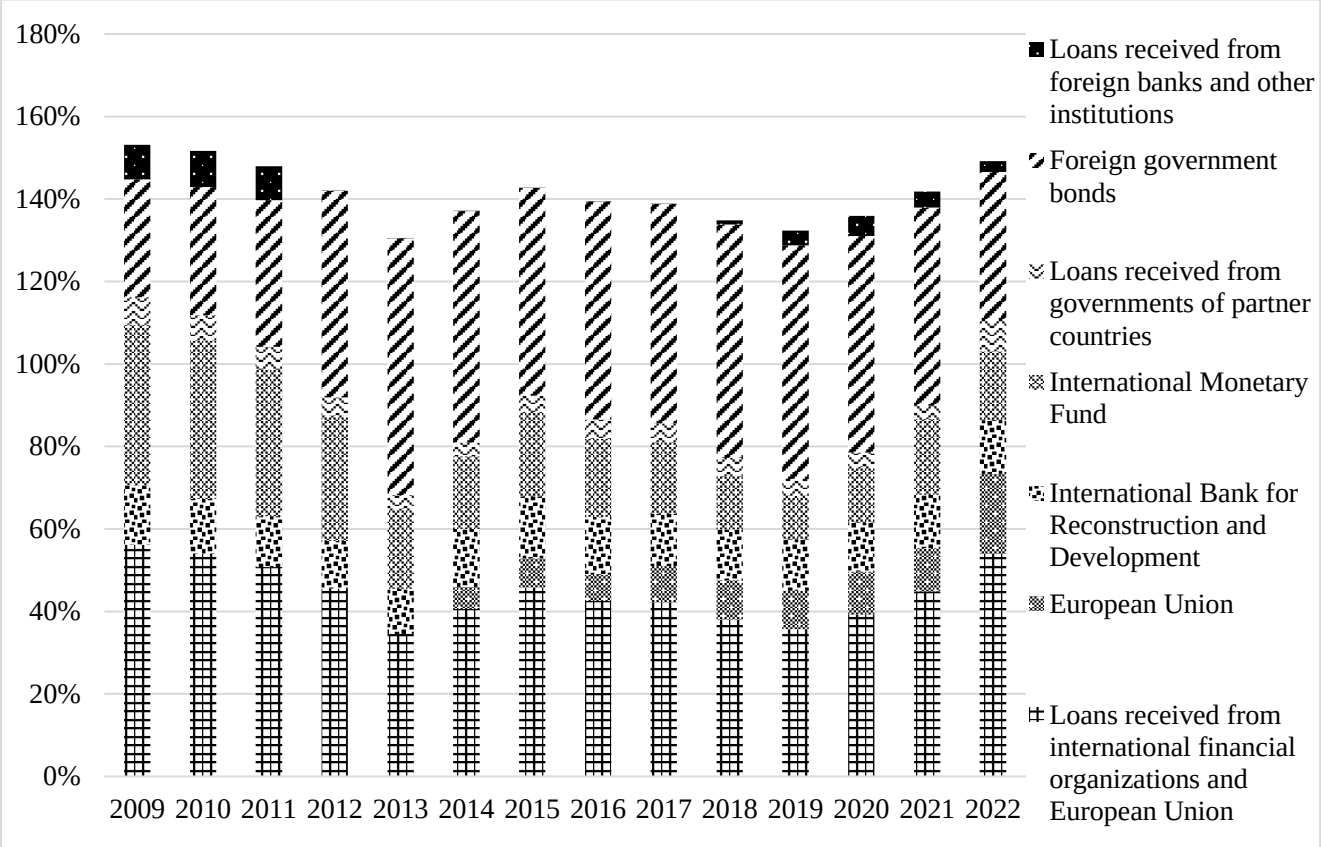


Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 8. Domestic government bonds (DGB) issued on the internal market for 2009-2022, billion US$

Analysing the structure of external public debt of Ukraine, it is possible to notice that the largest structural share during 2009-2011 is occupied by debts received from international financial

organizations (see Fig. 9). However, since 2012, foreign government bonds have become the largest structural element of foreign state debt with simultaneous decrease in quota of International Monetary Fund loans. Such dynamics are connected with repayments to international financial organizations of funds borrowed during the crisis and their replacement by government bonds with a more favourable interest rates. This trend was also influenced by the increased possibility for Ukraine of trading government securities on foreign markets.



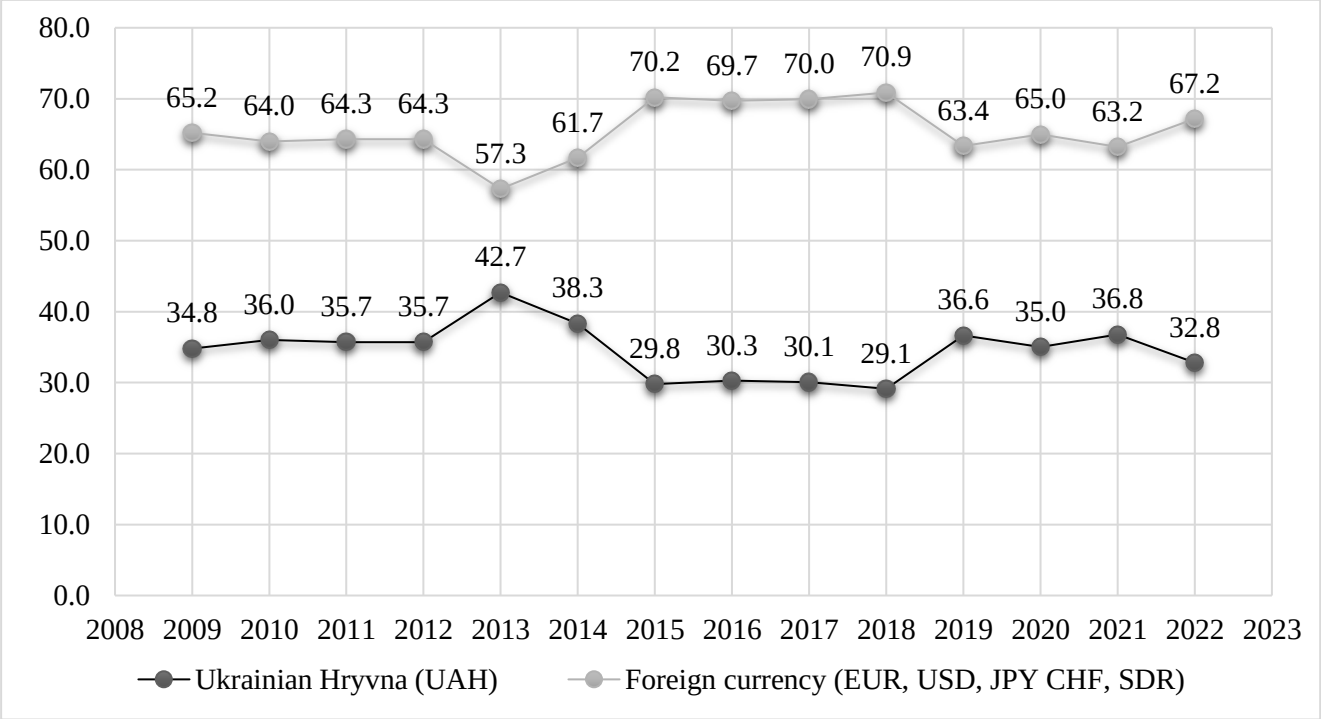
Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 9. The structure of external debt of Ukraine from 2009 to 2022, % of the total amount of external state debt.

During the period of analysis, the main creditors of Ukraine among international financial organizations are: International Monetary Fund, with average share of 22% and International Bank for Reconstruction and Development, with average quota of 13% (see Fig. 9). Starting from 2014 – the year of crucial changes in political and economic system of Ukraine on the way to its European Union integration the role of EU in structure of external government debt started to grow from 5% to 19% in 2022. During 2009-2022 the average share of the loans received from governments of partner countries is 5%, with the highest quota of 8% in 2022, which caused by sharp increase in amount of direct foreign government loans provided to Ukraine due to the high need in the big amount of financial resources in short order for the economic stabilization and defence sector financing to ensure the survival of the state

during the war time.

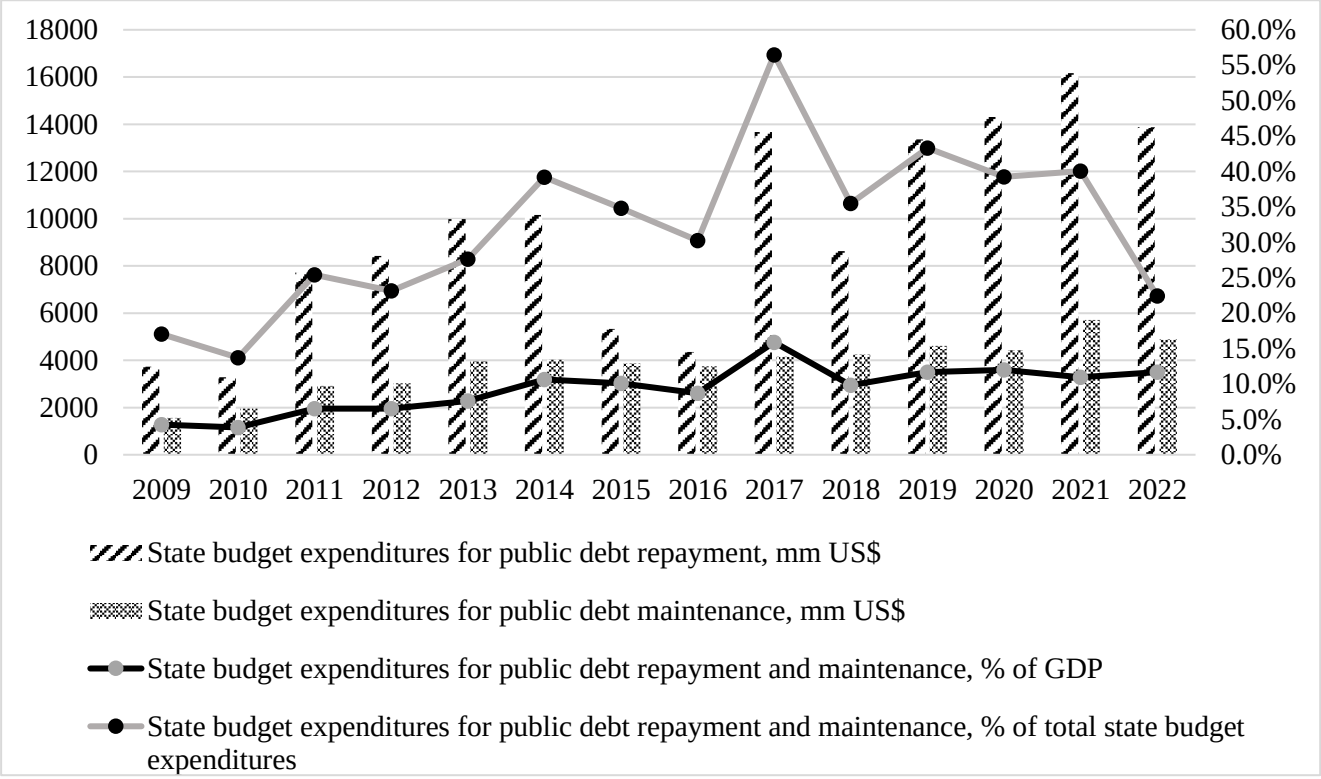
During the 2009-2022 period, the share of public debt repaid in foreign currency remains quite significant and constantly exceeds its quota repaid in national currency (see Fig. 10).



Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 10. Ukrainian public debt structure in terms of currencies of repayment in 2009-2022, % of public debt

The highest value of the share of foreign currency debt repayment reached the 70.9% in 2018 (see Fig. 10). It is worth noting that the largest share of public debt with national currency repayment of 42.7% was recorded in 2013. The share of public debt with foreign currency repayment increases during internal financial crises: in the periods of 2014-2018 (hybrid Russian aggression) and 2022 (full-scale war with Russia), as well as external ones - 2020 (outbreak of COVID-19). On the one hand, this is caused by the need of the Ukrainian government to decrease the gap in the state's payment balance as well as to stabilize the foreign currency and gold reserves. On the other hand, the challenging time for the Ukrainian economy decrease the trust of the citizens in its ability to maintain and repay internal debts, that reduces the possibility for the government to effectively borrow on the domestic market due to lower amount of offered funds by individuals and businesses as well as higher loan interest rates. According to the analysed statistical information, it can be stated that the fluctuations in the Ukrainian public debt structure in terms of currencies of repayment highlight challenges in public debt management and the potential risks associated with a significant reliance on foreign currency debt, especially in the context of exchange rate movements.



Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

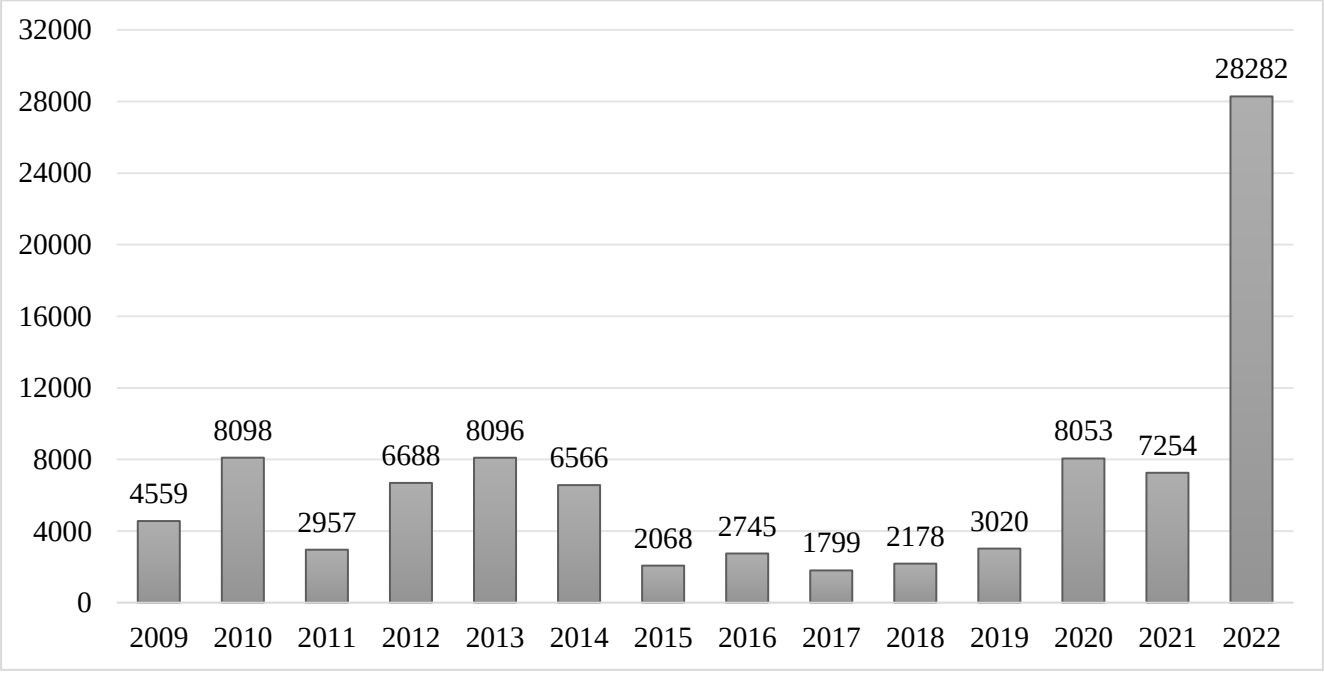
Fig. 11. Trends in state budget expenditures for public debt repayment and maintenance from 2009 to 2022

Based on the analysis of the dynamics of state budget expenditures for the repayment and maintenance of the public debt during 2009-2022, it is possible to conclude that there is a trend towards a constant increase in the absolute values of the total amount of such expenditures: from 5.3 billion of US$ in 2009 to 18.8 billion of US$ in 2022 (see Fig. 11). The percentage of GDP allocated to debt repayment and servicing has also exhibited a progressive climb, escalating from 4.4% in 2009 to 11.7% in 2022, signifying an expanding debt burden in relation to the country's economic output. A pivotal year was 2017, marked by an exceptional allocation of 56.5% of the state budget expenditures and 15.9% of GDP towards debt repayment and servicing due to the maturity of the loans received during 2013-2015 – period of economic and political instability in Ukraine as well as adoption of the public debt management policy, main goal of which was a decreasing of the level of Ukrainian debt burden. A sharp change in the amount of payments for repayment and servicing of the public debt compared to total expenditures of 22.4% in 2022 is due to the fact of a significant increase in the size of state expenditures by approx. 100% (nearly 50% of the increased amount was financed on the basis of financial assistance from partner countries and international financial organizations) (see Fig. 11). The projected increase in the amount of public debt in 2023 due to the continuation of the war creates additional threats to the management of the public debt, especially in terms of its repayment and servicing.

3.2. Empirical study of the main macroeconomic factors influencing the public debt dynamics of Ukraine

In order to carry out a complex study of the condition of the public debt of Ukraine and the level of debt sustainability of the state, it is necessary to analyse the strength and nature of the influence of the main macroeconomic factors on the dynamics of public debt. The interdependence and mutual influence of the public debt and the state budget deficit is the basis of the functioning of state finance system throughout the history of the development of the world economy. The emergence of a budget deficit as a phenomenon of exceeding the total amount of budget expenditures over its revenues is one of the main reasons for the occurring of the state borrowing due to the need to finance this fiscal gap. The stable and sound equilibrium between these macroeconomic variables is crucial for the government's fiscal health and debt sustainability. That is why the analysis of the condition and dynamics of the state budget deficit of Ukraine is enormously important.

Based on the analysed statistical information on the dynamics of the state budget deficit of Ukraine during 2009-2022, it can be stated that the periods of its greatest growth are associated with the presence of political, economic or military instability in state (see Fig. 12). It should also be noted that there were not any years with a planned or actual state budget surplus during the period under analysis.



Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 12. The dynamics of state budget deficit of Ukraine for 2009-2022, mm US$

In 2013, the growth of the state budget deficit compared to 2012 was 21%. The absolute value of this macroeconomic indicator that was reached in 2013 (more than 8 billion US$) remained the largest

until the 2022 (see Fig. 12). The period of economic stabilization, the implementation of socio-economic reforms, active cooperation with the International Monetary Fund and the European Union ensured a decrease in the overall size of the state budget deficit and its relative stabilization in the period of 2015-2019. The significant grow in the size of the state budget deficit in 2020 was due to the impact of the global pandemic and the need for increased financing of the health care, social protection and security sectors. The state budget deficit reached its highest value of more than 28.2 billion US$ in 2022, which was caused by the full-scale invasion of Russia into the territory of Ukraine and the related economic challenges.

During the 2009-2022 the state budget deficit values as % of GDP have multidirectional dynamics. The biggest relative values this macroeconomic indicator reached 6% in 2010, which was caused by falsely overestimated the planned amount of budget revenues when drawing up the state budget, and 17.6% in 2022, the main reasons of this sharp increase are the grow of absolute amount of state budget expenditures as well as decrease of GDP due to the start of full-scale war (see Table 9). The period of economic stabilization of 2017-2019 shows the sustainable levels of state budget deficit as a relative value to all analyzed macroeconomic indicators. Based on the Maastricht criteria, the value of state budget deficit as % of GDP should be less than 3% and this criterion was met by Ukraine during the 2015-2019 with average value of 2.1% and in of 1.8% in 2011.

Table 9. State budget deficit relative values to GDP, budget revenue and expenditures for 2009-2022

	State budget deficit, % GDP	State budget deficit, % of budget revenue	State budget deficit, % of budget expenditures
2009	3.7%	16.9%	14.5%
2010	6.0%	26.7%	21.1%
2011	1.8%	7.5%	7.0%
2012	3.8%	15.4%	13.4%
2013	4.4%	19.1%	16.0%
2014	4.9%	21.9%	17.9%
2015	2.3%	8.4%	7.8%
2016	2.9%	11.4%	10.2%
2017	1.6%	6.0%	5.7%
2018	1.7%	6.4%	6.0%
2019	2.0%	7.8%	7.3%
2020	5.1%	20.2%	16.8%
2021	3.6%	15.3%	13.2%
2022	17.6%	51.2%	33.9%

Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

In 2022 the value of state budget deficit as % of budget revenue was 51.2% and as a % of budget expenditures its value reached 33.9% (see Table 9). So, due to the full-scale war the gap between budget

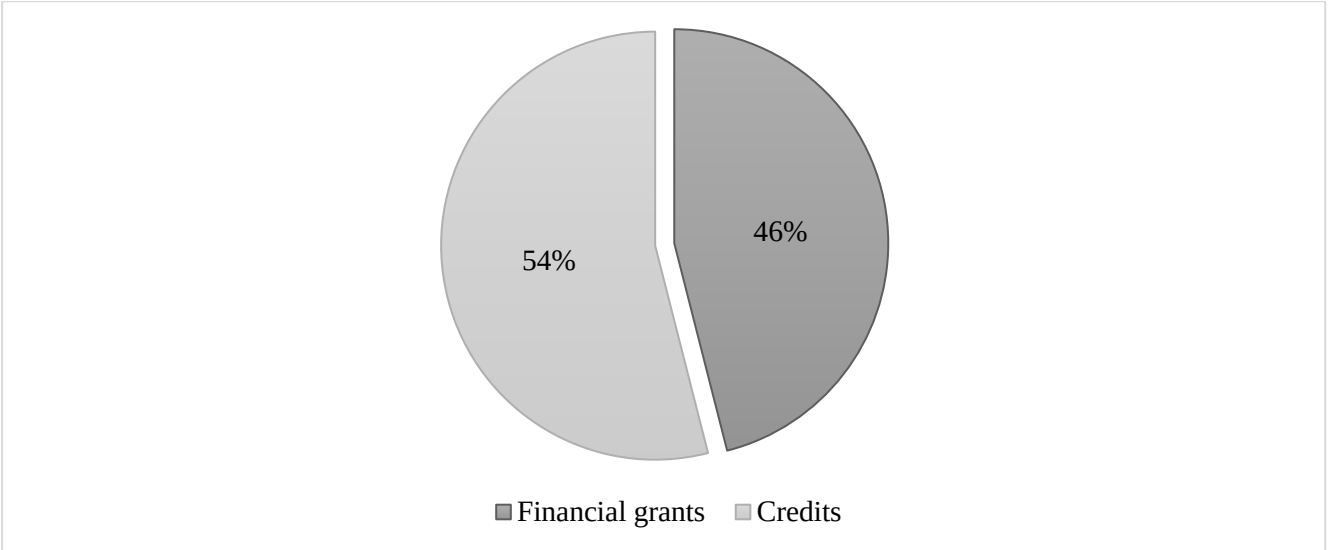
income and expenses was more than a half of the total amount of state budget revenue and more than one third of state budget expenditures. The major part of the budget shortage in 2022 was financed by the increase in public debt: internal and external, and provided interest-free loans as well as financial grants from foreign partner states (see Table 10). The full amount of financial grants was treated as revenue of the state budget of Ukraine and the total of external loans of 17.4 billion US$ as well as issued domestic government bonds of 10.9 billion US$ were used for the actual coverage of the state budget shortage.

Table 10. Received credits and grants by Ukraine from foreign governments and international financial institutions in 2022, billion US$

Financial grants	14.8
Credits	17.4
Total	32.2

Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Along with the debt instruments, the government's agreements with international partners made it possible to receive significant resources in the form of non-refundable financial assistance, which allowed to finance defence, social and economic spheres of the budget. The financial grants occupied the significant 46% of total amount of received and borrowed financial resources by Ukraine in 2022 (see Fig. 13). The biggest share of received financial grants was provided by the USA in amount of 11.6 billion US$. Grants, since they are non-repayable aid, became the most effective tool for ensuring the country's financial stability in conditions of war and related economic challenges.

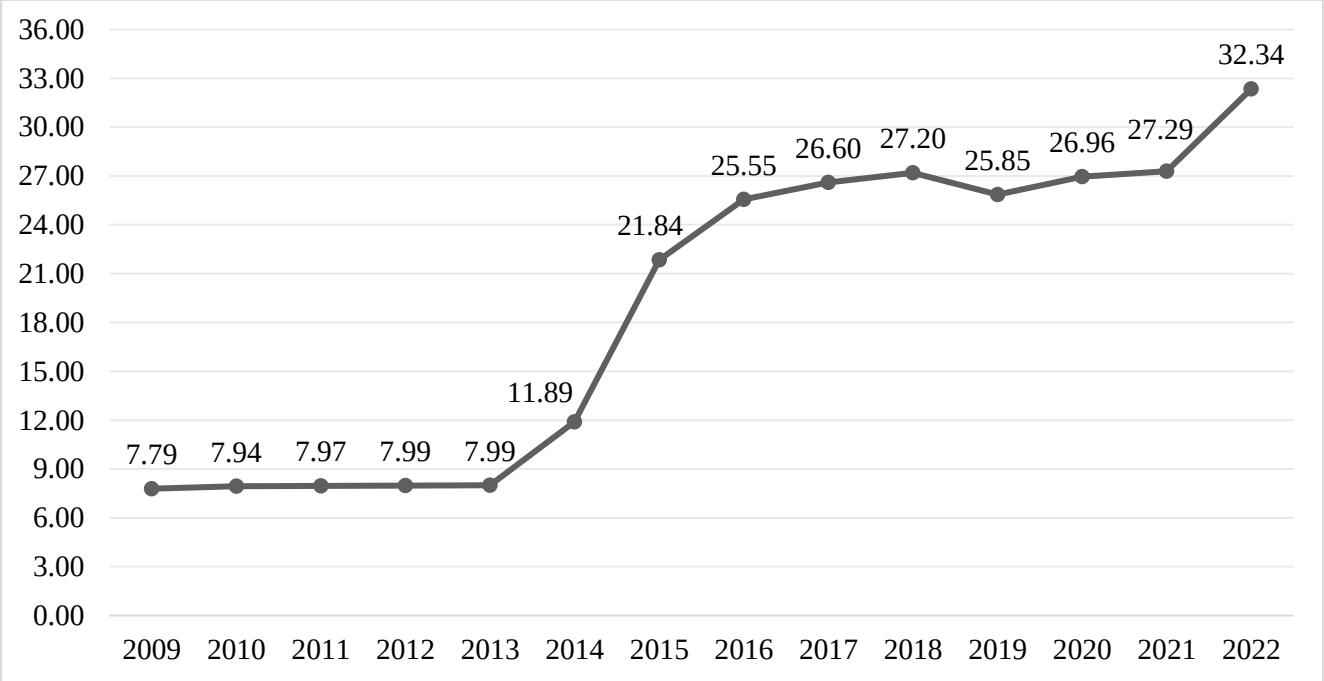


Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Fig. 13. Structure of the acquired financial resources by Ukraine in 2022, billion US$

A significant part of Ukraine's public debt is denominated in foreign currency (the major quota of which is occupied by the US$), so any changes in the official exchange rate directly affect the state's

ability to maintain and repay its debts. During the 2009-2022 the official exchange rate of Ukrainian Hryvna (UAH) to US$ has a steady upward trend, in the period under analysis it increased by 315% and reached 32.34 UAH for 1 US$ (see Fig. 14).



Source: compiled by the author according to The National Bank of Ukraine, 2023.

Fig. 14. Average official exchange rate of UAH to US$ in 2009-2022, UAH

The dynamics of the official exchange rate of UAH has 3 main stages (see Fig. 14):

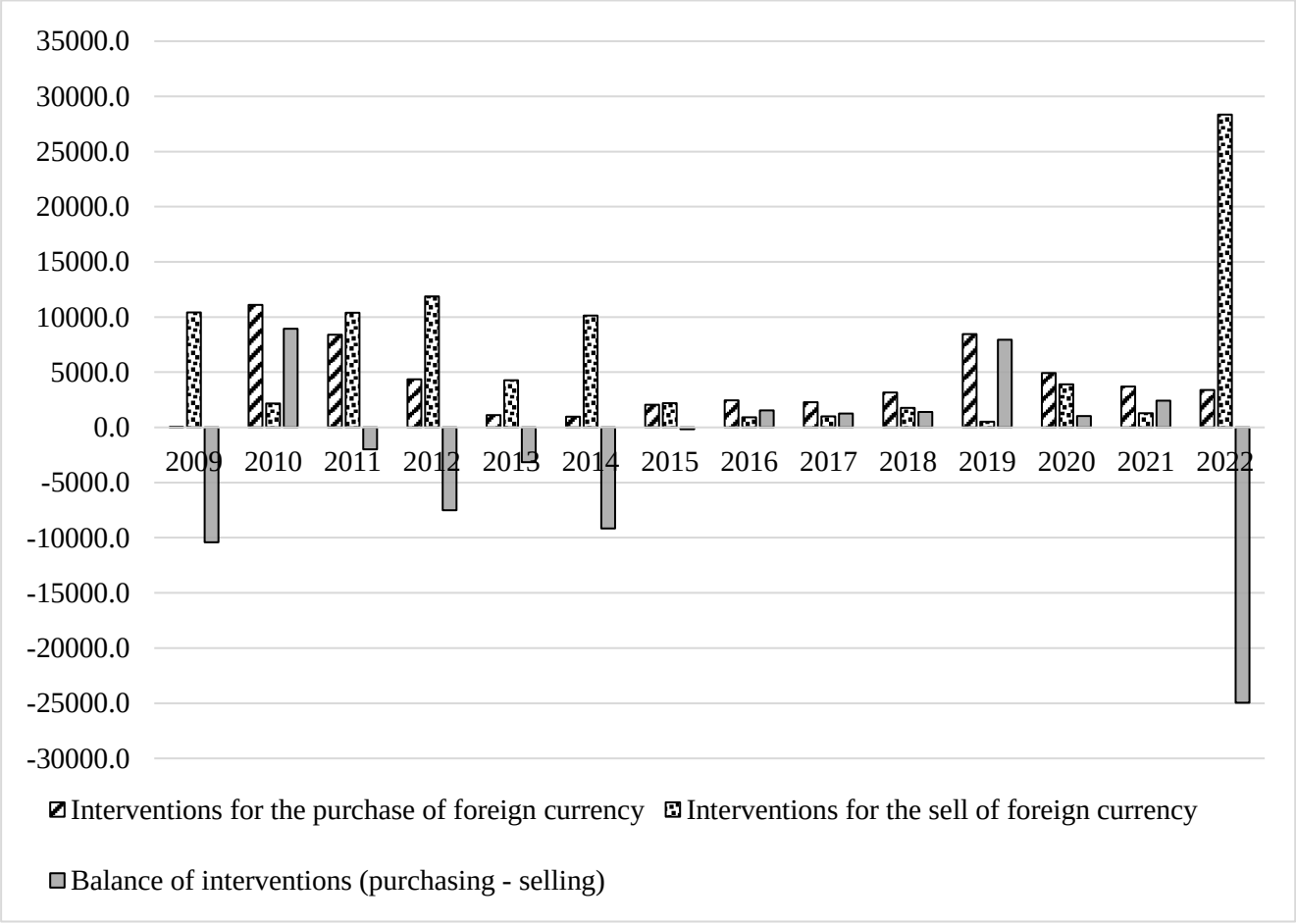
- from 2009 to 2013 it was fixed by the National Bank of Ukraine (NBU) through the process of currency interventions (Fig. 15) on the level of not more than 7.99 UAH for 1 US$. However, due to a significant reduction in the state's official gold and foreign currency reserves (which were used to maintain a fixed level of the exchange rate) to a level less than necessary to cover 3 months of future critical imports, as well as the beginning of Russia's military aggression, the NBU reviewed its policy and switched to a free-floating foreign exchange rate;

- from 2014 to January 2022 was the period of free-floating official currency exchange rate, which was formed as a result of the influence of demand and supply on the market. Due to the not sufficient amount of foreign gold and currency reserves as a result of previous policy of the NBU the official currency exchange rate grew by 115% during 2014-2016. After the stabilization of the economy and the state's ability to decrease the gap in export-import operations, the average official currency exchange rate balanced in the rage from 26.60 to 27.29 UAH for 1 US$ during 2017 - January 2022;

- from February 2022 it was again fixed by the NBU due to the full-scale war and catastrophic consequences to the national economy, by the significant increase the amount of sell of foreign currency through the interventions on the market (see Fig. 15) in order to fix the exchange rate firstly at the level

of 29.00 UAH for 1 US$, and then, due to the too fast consumption of official state gold and currency reserves at the level of 36.60 UAH for 1 US$. The support of the exchange rate was provided by the rhythm of the inflows of international financial aid and loans, which were used to replenish gold and foreign exchange reserves and were the basis for reducing a significant gap in the state's balance of payments.

Interventions of the NBU on the foreign currency exchange market are the main instrument of its implementation of the foreign exchange policy. They are the major stabilizing factor of the market that smooths out excessive exchange rate fluctuations by selling a certain amount of foreign currency to satisfy demand, as well as buying it to prevent a sharp strengthening of the national currency and replenishing gold and foreign exchange reserves. The largest volume of negative balance of interventions of the national bank falls during the period of post-crisis recovery in 2009 (-10.4 billion US$), the period of structural economic and socio-political changes in 2014 (-9.2 billion US$), as well as the period of the start of a full-scale war with Russia in 2022 (-24.9 billion US$) (see Fig. 15), which helped to avoid the panic on the financial market and bankruptcies of import-oriented businesses as well as protect Ukraine's import-dependent economy from the spiral of hyperinflation.



Source: compiled by the author according to The National Bank of Ukraine, 2023.

Fig. 15. Interventions of NBU on the currency market in 2009-2022, mm US$

The main instrument for stabilizing the situation on the foreign currency exchange market and covering gaps in the state's balance of payments is the official gold and foreign currency reserves (also called international reserves) of the central bank. Replenishment of gold and foreign exchange reserves can be carried out by borrowing funds from international financial organizations, banks and governments of foreign countries, and one of the directions of their use is the repayment of external liabilities of the state. That is why, the analysis of the dynamics of this indicator is necessary to assess the condition and credibility of Ukrainian public debt.

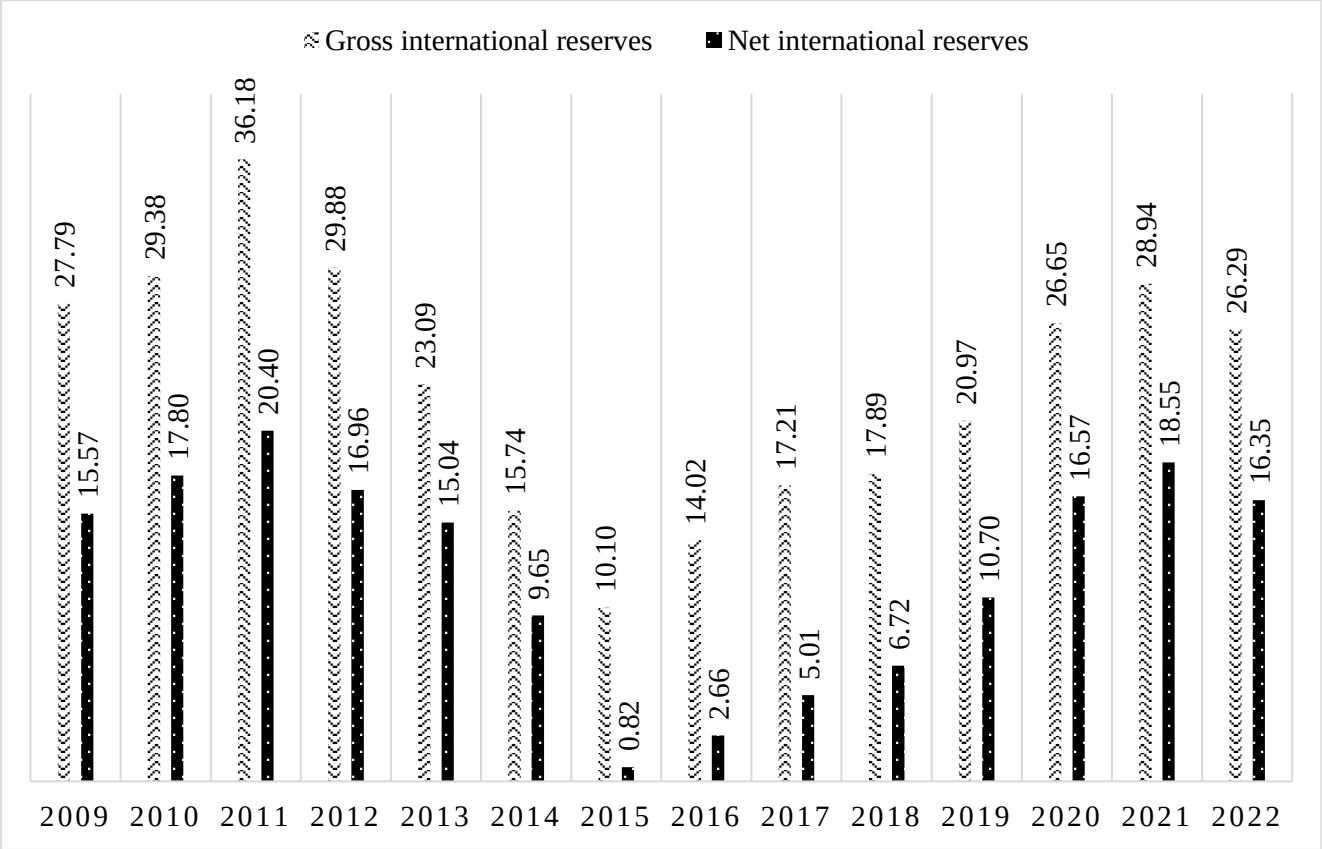
During 2009-2022 the dynamics of the total amount of the gross and net (excluding borrowed funds) Ukrainian gold and foreign currency reserves can be divided into 4 main stages (see Fig. 16):

1) The period from 2009 to 2011 can be described as steadily accumulation of the gross and net amount of international reserves due to the favourable situation on the currency market and effective cooperation with the International Monetary Fund. The average amount of gross international reserves grew by 30.2% and net reserves increased by 31% during 2009-2011.

2) The period from 2012 to 2015 can be characterized by permanent decrease in the amount of gold and foreign currency reserves as they were spent on repaying the external debt that grew during the global crisis and maintaining the fixed currency exchange rate until 2013, while the balance of payments deficit was growing. At the turn of 2014-2015, the international reserves of Ukraine fell to a catastrophically low level. In 2015 the average amount of net reserves of a country with a 40 million of population was less than 1 billion of US$; a huge amount of foreign currency was withdrawn from the banking system by non-residents, citizens and domestic businesses, so the NBU changed the policy of fixed foreign currency exchange rate into the free-floating one. During 2012-2015 the average amount of gross international reserves felt by 66.2% and net reserves decreased by 95.2%.

3) The period from 2016 to 2021 is a time of steadily grow in the total amount of international reserves of Ukraine based on economic stabilization, close cooperation with IMF and favourable situation on the foreign currency market due to the first positive results of the currency policy change. During 2016-2021 the average amount of gross international reserves grew by 106.4% and net reserves increased by 596.2%.

4) The period from 2022 till now is characterized by negative dynamics of the amount of Ukrainian international reserves due to the beginning of the full-scale war with Russia and state's economic destabilization. However, the reduction in the amount of gold and foreign currency reserves in 2022 (gross reserves were reduced by 9.1% and net reserves decreased by 11.9%), is not as catastrophic as it could be only because of the great financial support of international financial organization and governments of foreign partner countries.



Source: compiled by the author according to The National Bank of Ukraine, 2023.

Fig. 16. Yearly average gross and net international reserves of the NBU for 2009-2022, billion US$

Based on the statistical information for 2009-2022 the worst situation with the international reserves in Ukraine was during 2014-2016, the period of political and economic instability. The most dangerous situation according to the key indicators was in 2015, when amount of gross reserves was not enough to cover the minimum criteria of 3 month of future exports (only 2.5 months were covered), and the net reserves were only 0.9% of GDP and 8.1% of gross reserves. This means that 91.9% of all the reserves in that year are formed from the borrowed funds (see Table 11). As a result of conducted economic and social reforms and overall improvement in financial sector of Ukraine, the relative values of the official gold and foreign currency reserves became to meet essential requirements (starting from 2019 amount of gross reserves were enough to cover 3 month of future exports, the coverage of total money supply stabilized above 40%, net reserves became more than 50% of gross ones) (see Table 11). The biggest amounts of net international reserves of 65.1% were in 2013 and 64.1% in 2021. It is also possible to conclude that in 2022 according to calculate indicators there were not any catastrophic changes in the international reserves, especially when compared to a similar domestic crisis of an even smaller scale in 2015, only because of the great and permanent financial support from international financial organizations, governments of partner states and other institutions. In 2022 the amount of

international reserves met almost all minimal requirements except from the coverage of money supply above 40% due to a significant increase in the amount of the money supply as a result of the state budget deficit financing by "printing" unsecured money for the need of defence and social protection sectors additional financing during the first months of the full-scale invasion of Russia.

Table 11. Key relative values of the yearly average gross and net international reserves of the NBU for 2009-2022

	Gross international reserves as % of GDP	Gross international reserves in months of future imports	Gross international reserves as % of total money supply	Net international reserves as % of GDP	Net international reserves as % of Gross international reserves
2009	22.3%	3.3	45.2%	12.5%	56.0%
2010	21.6%	3.5	43.8%	13.1%	60.6%
2011	22.2%	4.3	44.5%	12.5%	56.4%
2012	17.0%	3.6	32.9%	9.6%	56.8%
2013	12.6%	3.2	21.7%	8.2%	65.1%
2014	11.8%	3.0	18.3%	7.2%	61.3%
2015	11.1%	2.5	24.0%	0.9%	8.1%
2016	15.0%	2.9	35.2%	2.9%	19.0%
2017	15.3%	3.1	42.0%	4.5%	29.1%
2018	13.7%	3.0	40.6%	5.1%	37.6%
2019	13.6%	3.8	42.2%	7.0%	51.0%
2020	17.0%	4.5	44.9%	10.6%	62.2%
2021	14.5%	4.1	41.5%	9.3%	64.1%
2022	16.4%	3.5	38.6%	10.2%	62.2%

Source: compiled by the author according to The National Bank of Ukraine, 2023.

Overall, the dynamics of main macroeconomic factors that have influence on the public debt of Ukraine shows the importance of ensuring stable amounts of international reserves and a sound amount of the budget deficit to smooth out sharp fluctuations of the main macroeconomic indicators due to the influence of internal or external negative factors and avoid panic on the financial market and the economic system of the state as a whole. This will help not to be subjected to the skyrocketing increase in amount of public debt and unwinding of a hyperinflationary spiral and a negative cycle relationship between public debt and budget deficit.

3.3. Correlation and regression analysis of the relationship between the level of public debt of Ukraine and main influencing macroeconomic factors

For the purpose of complex analysis of the Ukrainian public debt, the nature, strength and direction of relationship between it and key macroeconomic factors (yearly state budget deficit as % of GDP,

yearly average national currency exchange rate UAH for 1 US$, yearly average official amount of gross international reserves as % of GDP) will be analysed based on the construction of the multiple linear regression model. The model will be checked on the compliance with main multiple regression assumptions. The applied data are time series with 14 years observation period.

Then we can form the following hypothesis (H):

1) H1: The state budget deficit has the positive linear statistically significant influence on the dynamics of public debt of Ukraine.

2) H2: The national currency exchange rate has the positive linear statistically significant influence on the dynamics of public debt of Ukraine.

3) H3: The official amount of international reserves has the positive linear statistically significant influence on the dynamics of public debt of Ukraine.

In the Table 12 the variables with their acronyms, units of measurement and the data sources are represented.

Table 12. Model variables description and data sources

Variable	Denomination	Acronyms	Units of measurement	Data sources
Dependent	Public Debt	PD	as % of GDP	The Ministry of Finance of Ukraine
Explanatory	State budget deficit	BD	as % of GDP	The Ministry of Finance of Ukraine
	National currency exchange rate	ER	UAH for 1 US$	The National Bank of Ukraine
	Official amount of international reserves	IR	as % of GDP	The National Bank of Ukraine

Source: prepared by the author.

The summary of descriptive statistics for the dependent and explanatory variable is provided in the Table 13.

Table 13. Descriptive statistics of model variables

	PD	BD	ER	IR
Mean	0.53160	0.043857	18.942	0.16007
Median	0.53550	0.036448	23.698	0.15178
Minimum	0.32640	0.016036	7.7912	0.11098
Maximum	0.76000	0.17621	32.342	0.22302
Standard deviation	0.14595	0.040585	9.5897	0.037162
Missing observations	0	0	0	0

Source: prepared by the author using GRETL software.

In order to meet the stationary requirements and exclude the autocorrelation, there is a need to take

the second difference of model's variables. This will reduce the number of observations to 12. After the data modification the model's variables are named as stated in Table 14.

Table 14. Naming of variables after data modification

Variable	Denomination	Acronyms	After data modification
Dependent	Public Debt	PD	d_d_PD
Explanatory	State budget deficit	BD	d_d_BD
	National currency exchange rate	ER	d_d_ER
	Official amount of international reserves	IR	d_d_IR

Source: prepared by the author.

As a result of data modification, based on the Table 15, it is visible that the p-values of autocorrelation (ACF) and partial autocorrelation functions (PACF) of variables are above 0.05 (or significance at 5%), so we do not reject the H0 hypothesis about no autocorrelation. So, we can confirm that there is no autocorrelation in the model's variables.

Table 15. Autocorrelation functions of variables

	Lag	ACF	PACF	Q-statistics	p-value
d_d_PD	1	-0.1494	-0.1494	0.3407	0.559
d_d_BD	1	-0.4252	-0.4252	2.7610	0.097
d_d_ER	1	-0.0501	-0.0501	0.0383	0.845
d_d_IR	1	-0.3939	-0.3939	2.3701	0.124

Source: prepared by the author using GRETL software.

On the basis of conducted Augmented Dickey-Fuller tests (ADF) on Bayesian Information Criterion (BIC) of variables we can reject the H0 hypothesis (the series has a unit root or is not stationary), as the p-value is less than 0.05, so we can accept the H1 hypothesis: the data meets stationary requirement (see Table 16).

Table 16. ADF tests with constant for the model variables

	Lag	Asymptotic p-value
d_d_PD	1	0.04971
d_d_BD	1	1.947e-07
d_d_ER	1	0.04309
d_d_IR	1	0.0001728

Source: prepared by the author using GRETL software.

As the data meets the necessary assumptions and requirement the actual model can be constructed, see Equation (1).

$$d\_d\_PD = -0.0106548 + 1.16242 * d\_d\_BD + 0.0236050 * d\_d\_ER + 0.284663 * d\_d\_IR + \varepsilon \quad (1)$$

Table 17. Model 1: OLS, using observations 2011-2022

Dependent variable: d_d_PD

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	−0.0106548	0.0121394	−0.8777	0.4057
d_d_BD	1.16242	0.230692	5.039	0.0010
d_d_ER	0.0236050	0.00373553	6.319	0.0002
d_d_IR	0.284663	0.353702	0.8048	0.4442

Mean dependent var	0.010950		S.D. dependent var	0.124046
Sum squared residuals	0.013611		S.E. of regression	0.041247
R-squared	0.919588		Adjusted R-squared	0.889434
F(3, 8)	30.49593		P-value(F)	0.000100
Log-likelihood	23.66361		Akaike criterion	−39.32723
Schwarz criterion	−37.38760		Hannan-Quinn	−40.04535
Rho	0.112850		Durbin-Watson	1.730899

Source: prepared by the author using GRETL software.

For the purpose of model analysis let's introduce the hypotheses of F-test:

• H0: $\beta 1=\beta 2=\cdots=\beta p=0$

• H1: at least one coefficient $\beta \neq 0$

As the p-value is less than 0.05, we can reject the H0 hypothesis and accept the H1 hypothesis as two coefficients β in the model are significantly different from 0 (see Table 17).

- The p - value of d_d_BD variable is less than 0.05 so, we can reject the H0 hypothesis that there's no statistically significant relationship between d_d_PD and d_d_BD and conclude statistically significant influence of d_d_BD on d_d_PD.

- The p - value of d_d_ER variable is less than 0.05 so, we can reject the H0 hypothesis that there's no statistically significant relationship between d_d_PD and d_d_ER and conclude statistically significant influence of d_d_ER on d_d_PD.

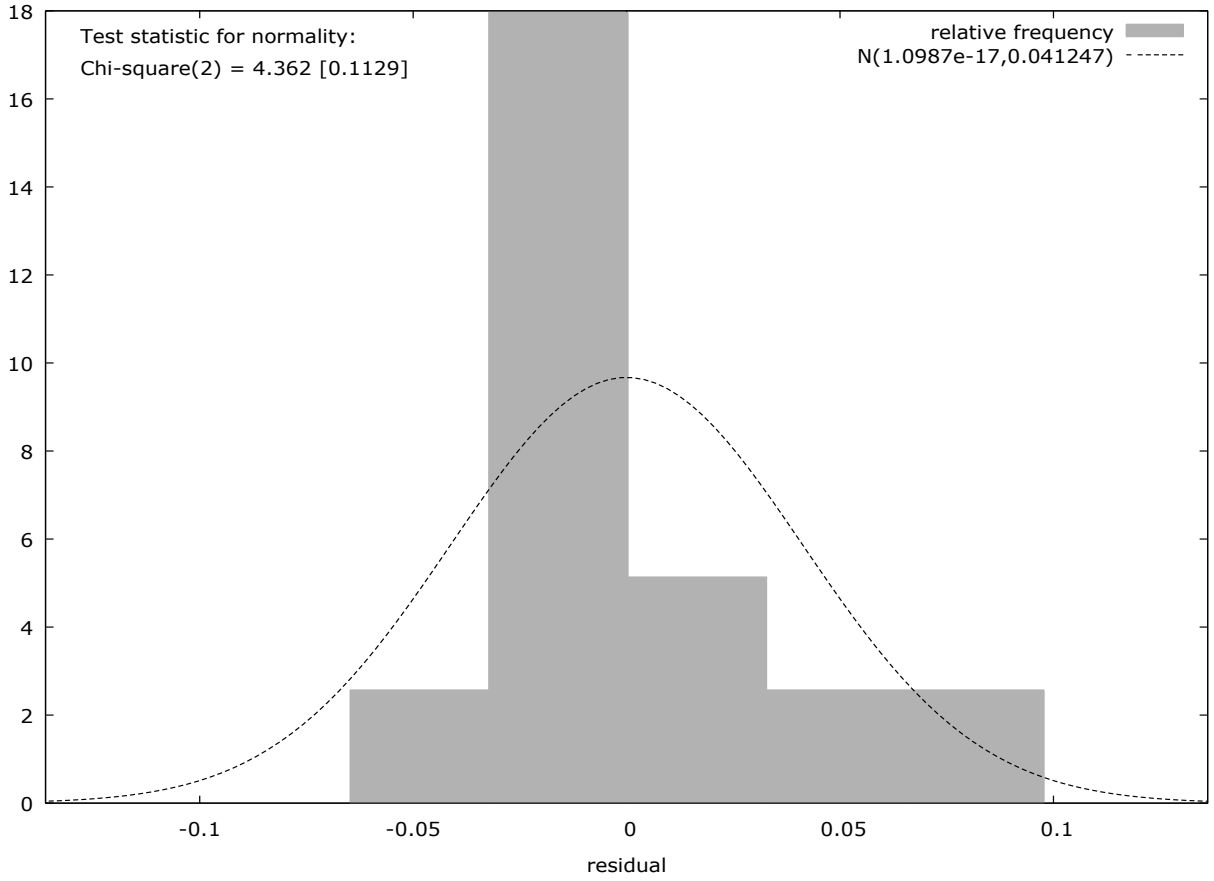
- The p - value of d_d_IR variable is greater than 0.05 then, we can not reject the H0 hypothesis and can not conclude its statistically significant influence on d_d_PD.

The higher the R-squared (coefficient of determination), the better the model explains the dependent variable. In this case the R-squared is 0.919 and displayed that the 91.9% of the variability of d_d_PD is explained by the d_d_BD, d_d_ER and d_d_IR.

Indeed, adding variables to the model cannot make the R-squared to decrease, even if the variables are not related to the dependent variables. Therefore, the Adjusted R-squared takes into account the complexity of the model (the number of variables) (Montgomery, Peck, & Vining, G. G., 2021). In this case, the Adjusted R-squared is 0.889 and indicates that 88.9% of the variability of d_d_PD is explained by the d_d_BD, d_d_ER and d_d_IR.

The normality of the residuals is one of the main assumptions of a linear regression model and will

be tested via frequency distribution of residuals (see Fig. 17). If the residuals are not normally distributed, the model does not explain all trends in the dataset.



Source: prepared by the author using GRETL software.

Fig. 17. Frequency distribution of model residuals

Based on the result of test for normality of residuals: Chi-square (2) = 4.362 with p-value 0.11294, we can conclude that as the p - value is higher than 0.05, then we do not reject the H0 hypothesis and confirm that the error in model is normally distributed.

The next step in model analysis is to test it on the existence of autocorrelation, multicollinearity and heteroscedasticity. Evaluation if the model meets classical assumptions of the multiple linear regression will be started with a set of autocorrelation tests: The Durbin-Watson test (see Table 18) and the Breusch-Godfrey test (see Table 19).

Table 18. The Durbin-Watson test for autocorrelation of the model

Durbin-Watson statistic = 1.7309	
H1 hypothesis: positive autocorrelation	p-value = 0.393098
H1 hypothesis: negative autocorrelation	p-value = 0.606902

Source: compiled by the author using GRETL software.

As the p - value is higher than 0.05, so we do not reject the H0 hypothesis and conclude that the linear regression residuals of time series data are uncorrelated (see Table 18).

Table 19. The Breusch-Godfrey test for autocorrelation of the model

	coefficient	std. error	t-ratio	p-value
const	0.000187114	0.0128263	0.01459	0.9888
d_d_BD	0.0382718	0.260220	0.1471	0.8872
d_d_ER	−0.000981145	0.00458949	−0.2138	0.8368
d_d_IR	−0.104212	0.448989	−0.2321	0.8231
uhat_1	0.216209	0.517009	0.4182	0.6883
- Test statistic: LMF = 0.174884, with p-value = P (F (1,7) > 0.174884) = 0.688 - Alternative statistic: TR^2 = 0.292493, with p-value = P (Chi-square (1) > 0.292493) = 0.589 - Ljung-Box Q' = 0.194106, with p-value = P (Chi-square (1) > 0.194106) = 0.66				

Source: prepared by the author using GRETL software.

As the p - value is higher than 0.05, than we do not reject the H0 hypothesis and conclude that there is no autocorrelation at any order less than or equal to p (see Table 19).

Evaluation of the model adequacy will be continued with the set of Heteroscedasticity tests: the Breusch-Pagan test (see Table 20) and White's test.

Based on the conducted White's test: Test statistic: TR^2 = 8.137907, with p-value = P (Chi-square (9) > 8.137907) = 0.520311, we can see that as the p - value is higher than 0.05, than we do not reject the H0 hypothesis and conclude that the heteroskedasticity is not present in the model.

Table 20. The Breusch-Pagan test for heteroskedasticity of the model

	coefficient	std. error	t-ratio	p-value
const	1.09670	0.505988	2.167	0.0621
d_d_BD	−4.34829	9.61558	−0.4522	0.6631
d_d_ER	−0.225467	0.155702	−1.448	0.1856
d_d_IR	17.5548	14.7428	1.191	0.2679
- Explained sum of squares = 9.64721 - Test statistic: LM = 4.823607, - with p-value = P (Chi-square (3) > 4.823607) = 0.185179				

Source: prepared by the author using GRETL software.

As the p - value is higher than 0.05, than we do not reject the H0 and conclude that the heteroskedasticity is not present in the model (see Table 20).

The model statistical adequacy evaluation is also done through the set of Multicollinearity tests: Variance Inflation Factor (VIF) (see Table 21) and the Belsley-Kuh-Welsch collinearity diagnostics (see Table 22).

Table 21. Variance Inflation Factor (VIF) test for multicollinearity in the model

Variable	Multiple correlation coefficient
d_d_BD	1.148
d_d_ER	1.059
d_d_IR	1.140

Source: prepared by the author using GRETL software.

According to the conducted test there is no excessive multicollinearity problem, as all the variables' values are lower than 10 and are close to minimum possible value - 1.0 (see Table 21).

Table 22. The Belsley-Kuh-Welsch collinearity diagnostics for multicollinearity in the model

lambda	cond	const	d_d_BD	d_d_ER	d_d_IR
1.575	1.000	0.071	0.193	0.136	0.163
0.951	1.287	0.785	0.010	0.001	0.195
0.828	1.379	0.058	0.091	0.862	0.098
0.645	1.562	0.087	0.705	0.001	0.545
- lambda = eigenvalues of inverse covariance matrix (smallest is 0.645207) - cond = condition index - note: variance proportions columns sum to 1.0					

Source: prepared by the author using GRETL software.

The test shows no evidence of excessive multicollinearity as there are no any condition indices greater than 10 (see Table 22).

On the basis of the conducted evaluations and test, it is possible to conclude:

1) The variables meet the necessary statistics requirements.

2) Residuals are normally distributed.

3) There are no autocorrelation, heteroscedasticity and multicollinearity in model.

4) The model meets all the classical assumptions of the multiple linear regression, thus it is statistically adequate and significant.

As the results of the regression analysis are statistically adequate and significant, we can form the following conclusions:

• The 88.9% of the variability of public debt is explained by state budget deficit, national currency exchange rate and official amount of international reserves and 11.1% by other factors.

• The H1 hypothesis is accepted. National currency exchange rate has the statistically significant positive linear influence on the variability of the public debt of Ukraine. The exchange rate of the Ukrainian hryvnia to the US dollar has a direct impact on the public debt, as a significant portion of Ukraine's debt is denominated in foreign currencies. A weaker hryvnia leads to an increase in the value of the country's external debt, making it more difficult to service, so there is a need to make additional borrowings.

• The H2 hypothesis is accepted. The state budget deficit has the statistically significant positive linear influence on the variability of the Ukrainian public debt as the budget deficits results in the accumulation of public debt and vice versa. When a government runs a budget deficit, it has to borrow money to make up for the shortfall in revenue, which adds to the public debt.

• The H3 hypothesis is rejected, as there is no statistically significant positive linear influence of the official amount of international reserves on the variability of the Ukrainian public debt. This can be

explained in the following way: until the 2013 Ukraine was spending the international reserves on the maintenance of fixed foreign currency exchange rate: as the amount of them was enough according to the previously described indicators, public borrowing was not used to replenish them, as well as usage of reserves on the public debt repayment was minimal. However, starting from 2014 the official foreign currency and gold reserves had been replenished mostly by the NBU buying interventions during the favorable situation on the foreign currency market due to the changes in monetary policy and move to the free-floating exchange rate.

4. ASSESSMNET OF UKRAINE'S DEBT CREDIBILITY AND SUSTAINABILITY LEVEL

Achieving the efficiency of public debt management is possible by maintaining a stable level of public debt credibility and sustainability. The sound level of stability of state finances to internal and external challenges is ensured, if the developed standards and norms by international and Ukrainian institutions are met. In addition, the level of stability and predictability of the debt burden on the state economy grows as a result of compiling with key normative indicators, which in turn increases the effectiveness of planning and management of the public debt.

On the basis of the calculated solvency indicators of Ukrainian debt credibility and sustainability in 2009-2022 (see Table 23), it can be asserted that during 2009-2014 Ukraine's public debt solvency indicators remained relatively stable and were withing the set norms. However, public debt relative value to GDP started approaching the upper limit of the norm, reaching 52.3% by 2014. The 2015-2016 was the period of economic and political instability, poor public debt management and lack of coordination between government ministries in Ukraine can be characterized by not complaining with main public debt solvency indicators: public debt to GDP ratio was higher than 60%, external debt to GDP was more than 40%, internal debt relative values to GDP as well as external debt to export ratio were almost on the upper limit of the respective norms. During 2017-2021 as a result of economic reform and political stabilization the main indicators of public debt credibility and sustainability started to meet the norms, public debt to GDP ratio reached 49% in 2021. In 2022 significant non-fulfilment of basic norms may be noticed. In 2022 due to the sharp decrease in export operations, the relative to them indicators of public debt reached the worst results during the period of analysis: external debt to export ratio grew to 174.7%, which is much higher than set standards as well as public debt maintenance payments to export ratio increased to 45.8% (see Table 23). Overall, the lowest levels of Ukrainian public debt credibility and sustainability based on calculated solvency indicators were in 2015 and 2022, the periods of the ones of the biggest economic, political, social challenges in the history of the state.

Table 23. Solvency indicators of Ukrainian debt credibility and sustainability

	Public debt to GDP, %	External debt to GDP, %	External debt to export, %	Internal debt to GDP, %	Public debt maintenance and repayment expenses to export, %
2009	32.6%	21.8%	73.2%	10.8%	14.3%
2010	39.9%	25.6%	73.5%	14.4%	11.1%
2011	36.3%	23.0%	60.1%	13.3%	17.0%
2012	36.7%	22.0%	60.0%	14.7%	17.8%
2013	39.9%	20.5%	63.6%	19.4%	23.6%

Table 23 is continued on the next page

Continuation of the Table 23

	Public debt to GDP, %	External debt to GDP, %	External debt to export, %	Internal debt to GDP, %	Public debt maintenance and repayment expenses to export, %
2014	52.3%	29.1%	76.8%	23.2%	28.1%
2015	71.9%	47.7%	122.6%	24.2%	26.0%
2016	76.0%	48.9%	124.0%	27.2%	24.2%
2017	68.0%	43,9%	124.0%	24.3%	44.9%
2018	59.8%	38.5%	116.4%	21.3%	27.9%
2019	54.8%	31.8%	106.2%	23.0%	39.0%
2020	57.6%	34.3%	119.0%	23.3%	41.5%
2021	49.0%	28.6%	90.6%	20.4%	34.7%
2022	69.4%	44.5%	174.7%	24.9%	45.8%
Ukrainian norms, %	***≤ 60***	***≤ 40***	***≤ 150***	***≤ 30***	***≤ 20***
International norms, %	***≤ 60***	***≤ 25***	***≤ 70***	***≤ 30***	***≤ 25***

Source: prepared by the author.

The next important indicators that will be analysed under the assessment of Ukrainian public debt credibility and sustainability belong to the group vulnerability of debt credibility (see Table 24). During 2009-2022, there was not stable upward or downward dynamics of the level of Ukrainian public debt credibility and sustainability due to various influencing factors. In 2009-2022 the external debt to GDP ratios were above the developed norm, which negatively affects the level of debt credibility because it increases the level of currency risk and interest rate risk. The highest public debt repayment and maintenance expenditures to state budget ratio of 29% was in 2017 due to the maturity of loans received during the 2014-2016 as well changes in the public policy with the goal of decreasing the total amount of public debt and as a result the level of debt burden on the state. Average weighted yield domestic government bonds on the primary market ratios were stable during 2009-2017, but sharply increased by 17.8% in 2018 and by 16.9% in 2019 as a result of changes in NBU key policy rate due to pressure on the currencies of developing countries as a result of capital outflow, increase in the volatility of the hryvnia exchange rate and political instability, as well as a more significant rise in domestic demand due to high rates of wages grow in 2018-2019. The highest value of average weighted yield domestic government bonds on the primary market ratio of 2022 was reached in 2022 (see Table 24), due to sharp grow in NBU key policy rate as a result of adopted strict monetary policy in order to avoid panic in the financial system and stabilize level of inflation. The “EMBI + Ukraine” index (J.P. Morgan Emerging Markets Bond Index) characterizes the difference in the yield of Eurobonds of Ukraine and US Treasury

obligations. The highest level of this indicator was equal to 3800 points in 2022, more than three times higher than the set norm, which showed the high risk of the state default due to the unprecedented political and economic challenges. The public debt maintenance expenses to GDP ratio was under the normative value during the analysed period and reached its highest dangerous value of 4.3% in 2009. During 2009-2022 Ukraine met the developed norm for the external debt maintenance expenditures to state budget expenditures ratio, the highest value of this indicator of 14.6% was reached in 2015, which was close to the upper limit of the level of established standard. So, the lowest levels of Ukrainian public debt credibility and sustainability based on the calculated indicators of vulnerability of debt credibility were in 2015 and 2022 as a result of influence of complex internal and external factors on the functioning of the state economic system.

Table 24. Indicators of vulnerability of debt credibility of Ukraine

	Public debt repayment and maintenance expenditures to state budget, %	External debt to public debt, %	External debt maintenance expenditures to state budget expenditures, %	Public debt repayment and maintenance expenses to GDP, %	Average weighted yield domestic government bonds on the primary market, %	Emerging Markets Bond Index (EMBI) + Ukraine, points
2009	9.1%	66.8%	5.0%	4.3%	12.2%	1002
2010	7.6%	64.0%	5.1%	1.4%	10.4%	436
2011	13.0%	63.3%	7.0%	1.8%	9.2%	869
2012	12.3%	59.9%	6.1%	1.7%	12.9%	598
2013	15.0%	51.4%	7.9%	2.2%	13.1%	844
2014	21.3%	55.6%	11.1%	3.0%	14.0%	2226
2015	18.0%	66.3%	14.6%	4.2%	13.1%	2375
2016	15.9%	64.3%	14.0%	4.0%	9.2%	860
2017	29.0%	64.5%	13.2%	3.7%	10.5%	574
2018	18.3%	64.4%	11.7%	3.2%	17.8%	571
2019	22.4%	58.0%	11.1%	3.0%	16.9%	723
2020	21.3%	59.5%	9.3%	2.8%	10.2%	1083
2021	21.4%	58.4%	10.4%	2.9%	11.3%	1014
2022	13.5%	64.1%	5.8%	3.0%	18.3%	3800
Ukrainian norms, %	***≤ 25***	***≤ 50***	***≤ 10-15***	***-***	***≤ 11***	***≤ 1000***
International norms, %	***≤ 25***	***-***	***≤ 10-15***	***≤ 5***	***-***	***≤ 1000***

Source: prepared by the author.

The debt liquidity group of indicators during 2009-2015 shows the general dynamics to deterioration and overall decrease in the level of Ukrainian public debt liquidity due to permanent

reduction in the total amount of official state gold and currency reserves (in 2015 the international reserves covered only 23.3% of external debt and the public debt to reserves ratio was 648.2%) (see Table 25) as they were used mainly for maintenance of the fixed foreign currency exchange rate. As a result of economic reforms and efficient cooperation with international financial institutions, the debt liquidity indicators began to approach the normative values during 2016-2021 (see Table 25). In 2021 the amount of international reserves was enough to cover 105.5% of short term external debt; 50.6% of total external debt as well as public debt to international reserves ratio was 338.5% which fully corresponds to the Ukrainian normative values, only international standard of <330% of public debt to international reserves ratio is not slightly met. Overall, only during 2009-2013 and in 2021 all the necessary norms were met which shows the significant negative fluctuations in indicators of liquidity of the Ukrainian public debt that increases the level of its risk and reduces the efficiency of public debt management.

Table 25. Debt liquidity indicators of Ukrainian public debt

	Official state gold and currency reserves to short-term external debt, %	Official state gold and currency reserves to External debt, %	Public debt to Official state gold and currency reserves, %
2009	152.4%	102.3%	146.4%
2010	134.2%	84.5%	184.8%
2011	135.8%	96.6%	163.7%
2012	116.2%	77.3%	215.8%
2013	106.0%	61.4%	316.8%
2014	54.1%	40.6%	443.5%
2015	32.3%	23.3%	648.2%
2016	46.6%	30.7%	521.7%
2017	60.2%	34.9%	443.5%
2018	64.5%	35.4%	437.9%
2019	85.7%	42.8%	402.2%
2020	82.7%	49.6%	338.7%
2021	105.4%	50.6%	338.5%
2022	59.3%	36.8%	423.9%
Ukrainian norms, %	***≥ 100***	***> 50***	***<500***
International norms, %	***≥ 100***	***-***	***<330***

Source: prepared by the author.

The calculation of the integral indicator of debt credibility and sustainability is an extremely important generalizing stage in the assessment of the conditions of Ukrainian public debt, as it allows to analyse the changes in the main indicators weighted by the respective coefficients during the research

period. The integral indicator of debt credibility and sustainability makes it possible to determine the general level of compliance of debt management during the analysed period with the main established norms.

We will firstly carry out an analysis based on weighting factors approved by the Ukrainian government with the statement that the smaller the value of the calculated integral indicator, the higher the level of debt credibility and sustainability of the Ukrainian public debt and the lower the level of public debt risks (see Table 26).

Table 26. Calculation of Integral indicator of Ukrainian debt credibility and sustainability, points

	Public debt to GDP	External debt to GDP	Average weighted yield domestic government bonds on the primary market	Emerging Markets Bond Index (EMBI) + Ukraine, points/1000	Public debt to official state gold and currency reserves ratio	Integral indicator of debt credibility and sustainability
2009	0.0716	0.0483	0.0223	0.1782	0.2903	0.6106
2010	0.0876	0.0567	0.0190	0.0775	0.3665	0.6073
2011	0.0797	0.0509	0.0168	0.1545	0.3246	0.6266
2012	0.0806	0.0487	0.0236	0.1063	0.4279	0.6871
2013	0.0876	0.0454	0.0240	0.1501	0.6282	0.9352
2014	0.1148	0.0644	0.0256	0.3958	0.8795	1.4801
2015	0.1578	0.1056	0.0240	0.4223	1.2854	1.9951
2016	0.1668	0.1083	0.0168	0.1529	1.0345	1.4794
2017	0.1493	0.0972	0.0192	0.1021	0.8795	1.2472
2018	0.1313	0.0852	0.0326	0.1015	0.8684	1.2190
2019	0.1203	0.0704	0.0309	0.1285	0.7976	1.1477
2020	0.1264	0.0759	0.0187	0.1926	0.6716	1.0852
2021	0.1076	0.0633	0.0207	0.1803	0.6712	1.0431
2022	0.1523	0.0985	0.0335	0.6756	0.8406	1.8006
Coefficient	***0.2195***	***0.2214***	***0.183***	***0.1778***	***0.1983***	***1.0000***

Source: prepared by the author.

Based on the calculated integral indicator of the Ukrainian public debt it is possible to conclude that the highest levels of debt credibility and sustainability were achieved during 2009-2013 with average of 0.6934 points and in 2021 with 1.0431 points, whereas the lowest levels were reached in 2015 of 1.9951 points and in 2022 of 1.8006 points (see Table 26).

In order to ensure the normalization and equalization of the components of the integral indicator of debt credibility and sustainability of the Ukrainian public debt, we will introduce a system for determining the compliance or non-compliance of the annual indicator with the norm established for it:

- If the indicator of the certain year meets the set respective norm, then its value in the integral

indicator will be 1.0.

- If the indicator of the certain year does not meet the set respective norm, then its value in the integral indicator will be 0.0.

- The minimum value of the indicator is 0.0 and the maximum is 5.0.

Based on this normalization, we will state that the bigger the value of the calculated integral indicator, the higher the level of debt credibility and sustainability of the Ukrainian public debt and the lower the level of public debt risks (see Table 27).

Table 27. Calculation of Integral indicator of Ukrainian debt credibility and sustainability with employed equalization and normalization, points

	Public debt to GDP	External debt to GDP	Average weighted yield domestic government bonds on the primary market	Emerging Markets Bond Index (EMBI) + Ukraine, points	Public debt to official state gold and currency reserves ratio	Integral indicator of debt credibility and sustainability
2009	1	1	0	0	1	3
2010	1	1	1	1	1	5
2011	1	1	1	1	1	5
2012	1	1	0	1	1	4
2013	1	1	0	1	1	4
2014	1	1	0	0	1	3
2015	0	0	0	0	0	0
2016	0	0	1	1	0	2
2017	1	0	1	1	1	4
2018	1	1	0	1	1	4
2019	1	1	0	1	1	4
2020	1	1	1	0	1	4
2021	1	1	0	0	1	3
2022	0	0	0	0	1	1
Norm	***<60%***	***<40%***	***<11%***	***<1000***	***<500%***	***≥4***

Source: prepared by the author.

The calculation of integral indicator of public debt of Ukraine with employed equalization and normalization of indicator's structural elements weights shows that the highest levels of debt credibility and sustainability of the Ukrainian public debt were achieved during 2010-2013 with average value of 4.5 points and during 2017-2020 with average value of 4.0 points, whereas the lowest levels were reached in 2015 of 0.0 points and in 2022 of 1.0 point (see Table 27).

The debt credibility and sustainability level can be also analysed based on the credit ratings from the lead rating agencies: Moody's, Standard & Poor's and Fitch Ratings that conduct the assessment of qualitative and quantitative information about the debtor, including information provided by the debtor and other non-public information obtained by rating agency analysts. The rating of the issuer

characterizes the level of the ability of the issuer of securities to pay interest and principal on debt obligations in a timely manner and in full in relation to the debt obligations of other borrowers (The ministry of Finance of Ukraine, 2023). The ratings and compliance scales of the world's leading rating agencies are different (see Annex 2).

Based on the latest ratings for 2022 it is possible to conclude that according to the Moody's, Standard & Poor's and Fitch Ratings the vulnerability to default of Ukraine is confirmed both in foreign and national currencies. The financial condition of the Ukraine is unfavourable with a high probability of suspension of debt payments (see Table 28). Such low credit rating of the Ukrainian public debt that causes a substantial risk for investors to buy domestic and foreign government bonds is a result of the full-scale war with Russia and the respective financial challenges for the state.

Table 28. Current credit ratings of Ukraine's debt obligations

Rating agency	Rating of debt liabilities in foreign currency		Rating of debt liabilities in national currency		Forecast	Rating date
	Long term liabilities	Short-term liabilities	Long term liabilities	Short-term liabilities		
“Fitch Ratings” (Fitch)	CC	C	CCC-	C		August 17, 2022 - rating confirmed
“Standard & Poor's” (S&P)	CCC+	C	CCC+	C	Stable	August 19, 2022 - the rating was increased and the forecast was changed
“Moody's Investors Service” (Moody’s)	Caa3	-	Caa3	-	Negative	May 20, 2022 - downgraded rating and forecast

Source: compiled by the author according to The Ministry of Finance of Ukraine, 2023.

Despite the unprecedent pressure on the economic system of Ukraine, the government succeeded in the negotiation with main creditors to restructure the public debt and prolong the maturity dates as well as introduced the war-bonds for citizens and businesses in Ukraine in order to accumulate the necessary resources on the internal financial market. Ukraine did not announce even a partial default on its obligations due to timely financial support of international financial institutions and governments of partner countries. Nevertheless, the debt burden on Ukraine is growing which is reflected in the long-term forecasts of the lead credit rating agencies (see Table 28).

CONCLUSIONS

This study aimed to conduct a complex evaluation on the conditions and dynamics of public debt in Ukraine and identify the actions that would increase the level of the public debt credibility and sustainability through its management.

As highlighted in the theoretical part of the research the public debt had been playing crucial role in the states' finance systems during the whole history of the development of the world economy. According to a review of the scientific literature, "public debt" refers to a specific category of financial instruments that the state uses as a borrower to establish relationships with foreign economic entities, states, and international organizations as creditors. These relationships are defined by the amount owed to creditors on a given reporting date as well as the repayment and maintenance schedules. The public debt is the total amount of external, internal and state-guaranteed debts of the state.

Nowadays, the public debt management is one of the most important tasks of the government in ensuring the stability of state finances and sustainable rates of economic growth. The concept of "public debt management" can be defined as a certain, maintained by state authorities, complex of measures related to acquiring resources on the terms of state credit, their placement, repayment and maintenance. Its main goal is to ensure the state's macroeconomic stability while maintaining an acceptable and manageable level of public debt credibility and sustainability.

The complex empirical analysis of public debt trend showed the existence of high debt burden on the Ukrainian finance system with a prospect of further deterioration due to the continuing full-scale war with Russia and related economic challenges. During the 2009-2022, the public debt reached its greatest relative value of 76% of GDP in 2016. In general, from 32.5% relative to GDP in 2009, the total amount of debt grew to 69.4% in 2022. During 2009-2022 the maximum share of external state debt in the total structure of the public debt of 57.1% was reached in 2022 as well as the share of foreign currency debt repayment increased to 67.2%, which in total indicated the high level of currency risk for Ukraine's public debt. During 2009-2022 there is a trend towards a constant increase in the absolute values of the total amount of expenditures for the repayment and maintenance of the public debt: from 5.3 billion of US$ in 2009 to 18.8 billion of US$ in 2022. The percentage of GDP allocated to debt repayment and servicing has also exhibited the subsequent grow from 4.4% in 2009 to 11.7% in 2022, signifying an expanding debt burden in relation to the country's economic output.

Analysis of the main macroeconomic factor that influence on the public debt dynamics demonstrated the presence of significant fluctuations throughout the 2009-2022. In 2022 the state budget deficit reached its highest value of more than 28.2 billion US$ or 17.6% of GDP due to the start of full-scale war. In 2022 the value of state budget deficit as % of budget revenue was 51.2% and as a % of budget expenditures it was 33.9%. The biggest part of the deficit was covered by financial grants and

credits from partner countries and international financial organizations.

During the 2009-2022 the official exchange rate of Ukrainian Hryvna (UAH) to US$ has a steady upward trend, in the period under analysis it increased by 315% and reached 32.34 UAH for 1 US$, fixation of exchange rate in 2022 led to the largest volume of negative balance of interventions of the NBU of -24.9 billion US$.

In 2022 the amount of international reserves met almost all minimal requirements except from the coverage of money supply above 40% due to a significant increase in the amount of the money supply as a result of the state budget deficit financing by 'printing' unsecured money. The decrease in 2022 of gross international reserves comparing to 2021 was by 9.2% and of net reserves the reduction was by 11.9%. Such a relatively optimistic situation formed only because of permanent and efficient financial support from international partners of Ukraine.

Better preparedness of the state and timely financial support from international partners allowed to prevent panic in the financial system of Ukraine, avoid state's default and even ensure a better level of economic stabilization than in 2014-2015 (the period of the revolution of dignity and the beginning of Russia's hybrid aggression). Nevertheless, the macroeconomic indicators show the dangerous situation in the finance system of Ukraine.

Correlation and regression analysis of the relationships between public debt as % of GDP as a dependent variable and yearly state budget deficit as % of GDP, yearly average national currency exchange rate UAH for 1 US$, yearly average official amount of gross international reserves as % of GDP as explanatory variables showed the existence of direct linear and statistically significant influence of the state budget deficit and yearly average national currency exchange rate on the dynamics of public debt. Whereas, yearly average official amount of gross international reserves does not have statistically significant influence on the public debt dynamics due to changes in monetary and intervention policies of NBU during 2009-2022. The model result shows that the 88.9% of the variability of public debt is explained by state budget deficit, national currency exchange rate, official amount of international reserves and 11.1% by other factors.

Evaluation of the Ukrainian debt credibility and sustainability is conducted based on Ukrainian and international norms. Integral indicator of debt credibility and sustainability is calculated based on The Ministry of Economic development of Ukraine methodology as well as author's proposed one (with normalization and equalization of parameters of integral indicator) showed the existence of a significant decrease in the level of compliance with established international and Ukrainian public debt management norms in 2022. In addition, the existence of an extremely high level of currency and interest rate risk of the public debt was confirmed by low ratings and negative forecasts of the main credit rating agencies such as the Moody's, Standard & Poor's and Fitch Ratings. These credit agencies disclosed investment in Ukraine's public debt as a substantial risk. Based on the calculated integral indicator of the Ukrainian

public debt, its lowest levels were reached of 1.9951 points in 2015 and of 1.8006 points in 2022 according to Ministry of Economic development of Ukraine methodology as well as 0.0 points in 2015 and 1.0 point in 2022 according to the proposed author's methodology. The calculation results show the dangerous level of public debt credibility and sustainability of Ukraine in 2022.

The conclusions formed based on constructed multiple linear regression model along with the debt credibility and sustainability analysis are the basis for the formed recommendations for the improvement and stabilization in public debt management during the wartime as well as post-war recovery period.

RECOMMENDATIONS

A systematic analysis of the conditions and dynamics of Ukraine's public debt as well as its management demonstrated the presence of a significant number of interrelated problems and risks that threaten the stable functioning of public finances both during the war and post-war recovery periods. The reduction of Ukraine's critical debt burden should be done taking into account the existing structure of the public debt, in which the share of external debt, primarily loans from international financial organizations and Eurobonds, prevails. In order to restore Ukraine's debt sustainability and credibility as well as eliminate the problems of funding shortages in the conditions of war and overall increase the level of public debt management efficiency, it is advisable to apply the instrument of public debt restructuring in the way of implementing the following specific priority measures:

1) To adopt the new public debt strategy, in which it is necessary to foresee methods of easing the debt burden (freezing, restructuring/write-off of public debt) and tools for optimizing public debt management from the point of view of the ratio of maintenance costs and risks.

2) To maintain political and technical support from international partners and institutions for guaranteeing immunity from default for the government through the use of mechanisms for freezing/postponing debt payments and post-war restructuring of Ukraine's external public debt, in particular as one of the prerequisites for financing economic recovery.

3) To submit an application to the IMF and the World Bank to include Ukraine in the list of countries in the world that can undergo debt write-off procedures of liabilities to international financial organization according to the rules of the ‘Brady plan’, HIPC and MDRI initiatives (see Annex 3).

4) To maintain and strengthen the negations regarding receiving financial grants and cheap, long-term loans from partner countries and international financial organizations. It is also worth working with the IMF to reduce the interest rate under the credit programs.

5) To work on the confiscation of assets of the Russian Federation and its citizens both in Ukraine and abroad in order to cover financial losses. More active involvement of lawyers, financiers and diplomats in this work is needed both inside Ukraine and abroad.

6) To ensure the maximum control over the use of borrowed funds as well as state budget funds as a whole. Funding should be provided only for important programs and the reduction of non-priority expenditures has to be done.

7) To introduce the progressive taxation and to increase significantly the luxury and excise taxes in order to accumulate resources to partially cover the state budget deficit.

In the period of post-war recovery, it is possible to provide the following recommendations:

1. To carry out systematic analysis and monitoring of indicators of the country's debt credibility and sustainability in order to make timely decisions on reduction of the negative impact of

destabilizing factors on economic processes.

2. To employ the active measures for exports stimulation and increase in domestic production in order to improve the situation with the balance of payments and increase confidence of business and citizens in state's ability to maintain and repay the public debt.

3. To accumulate the sound amount of official gold and foreign currency reserves according to the international norms in order to ensure the full compliance with the goals of monetary policy and reduction of the impact of exchange rate changes on the dynamics of public debt.

4. To convert the majority of liabilities issued in foreign currencies and the external component of the debt into the national currency and the internal component, respectively. The first stage is to reach the permanent share of external debt less than 50% of public debt total amount. This can be achieved by systematic development of the domestic financial market.

5. To repay the debt obligations at the expense of reparations from Russia and other feezed funds due to international sanctions.

6. To conduct a broad privatization of the state property - the demand for assets should increase and revenues to the budget will be greater than during active hostilities.

7. To acquire the non-refundable financial aid and use it to finance post-war reconstruction projects.

8. To utilize in the context of broader post-war reconstruction programs the possibility of using debt swaps in exchange for financing targeted programs for environmental protection and climate measures.

9. To employ the combination of large-scale state budget deficit reduction and implementation of the tax reform in order to decrease the shadow economy level and as a result - accumulate the necessary amount of resources for public debt maintenance and repayment.

10. To implement the full list of reforms and recommendations provided by the European Commission on the way to integration into the European Union as well as maintain effective cooperation with international financial organizations.

11. To establish the financial institution in Ukraine as a special agency designed to manage the sustainability and credibility of public debt with the aim of solving the problem of the institutional component of debt management and fiscal consolidation, as well as increasing the openness and attractiveness of investments in government securities.

The regime of austerity, maximum control over public funds, effective management of national debt together with the help of international partners will ensure the functioning of public finances and all systems in general during the war. Instead, tax liberalization, economic reforms and integration into the European Union in the period of post-war recovery will ensure the revival of the Ukrainian economy and increase the level of debt credibility and sustainability.

Future research directions. The direction of further research is a comprehensive assessment of the management of public debt by countries during military conflicts of various scales, as well as complex investigation of international debt relief programs with the aim of unifying and generalizing practical measures needed to maintain debt stability during internal and external shocks. This prospect of further research is chosen because of the significant number of military conflicts that arise in the modern world, the feature of most of which is a significant duration in time. The results of prospective studies will be useful both for Ukraine and for other states that are experiencing or will experience challenges of public debt management in a war economy.

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Shuper A. *Evaluation of Public Debt Management in Ukraine*. Financial management master thesis. Supervisor assoc. prof. dr. Liucija Birskyte. Vilnius: Mykolas Romeris University, Institute of Business and Economics, 2023

ABSTRACT

In the master's thesis the peculiarities, causes and consequences of the public debt dynamics in Ukraine and its structure, as well as the level of its credibility and sustainability in the period from 2009 to 2022 are analysed. Based on the statistical analysis the dynamics, structure and sustainability of the public debt of Ukraine is evaluated, as well as according to the correlation and regression analysis the statistically significant influence of the state budget deficit and currency exchange rate on the variability of the public debt is concluded. In the theoretical part of the master's thesis the concept, nature and peculiarities of the public debt and its management are presented. In the practical part the empirical evaluation of the public debt management in Ukraine is performed, also assessment of public debt credibility and sustainability in Ukraine is assessed. Practical part also includes the calculation of debt credibility and sustainability integral indicator based on approved institutional methodology in Ukraine and proposed by author methodology with normalization and equalization of parameters. On the basis of the results of conducted analysis the recommendations on the increase in the public debt credibility and sustainability of Ukraine during the war and post-war recovery are formed in the final part of the study.

Key words: public debt, public debt management, public debt credibility, public debt sustainability, wartime.

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ANOTACIJA

Magistro darbe nagrinėjami Ukrainos valstybės skolos dinamikos ir jos struktūros ypatumai, priežastys ir pasekmės, jos saugumo ir tvarumo lygis 2009–2022 m. laikotarpiu. Remiantis statistine analize, įvertinta Ukrainos valstybės skolos dinamika, struktūra ir tvarumas. Remiantis koreliacine ir regresine analize, daroma išvada apie statistiškai reikšmingą valstybės biudžeto deficito ir valiutos kurso įtaką valstybės skolos kintamumui. Teorinėje magistro darbo dalyje pristatoma valstybės skolos ir jos valdymo samprata, prigimtis ir ypatumai. Praktinėje dalyje atliktas empirinis valstybės skolos valdymo

Ukrainoje vertinimas, taip pat valstybės skolos saugumo ir tvarumo vertinimas Ukrainoje. Praktinėje dalyje taip pat atliktas skolos užtikrinimo ir tvarumo integralinio rodiklio apskaičiavimas pagal patvirtintą institucinę metodiką ir autoriaus pasiūlyta metodika su parametrų normalizavimu. Remiantis atliktos analizės rezultatais, baigiamojoje tyrimo dalyje pateikiamos rekomendacijos dėl Ukrainos valstybės skolos saugumo ir tvarumo didinimo karo ir pokario metu.

Raktiniai žodžiai: valstybės skola, valstybės skolos valdymas, valstybės skolos užtikrinimas, valstybės skolos tvarumas, karo metas.

SUMMARY

Throughout the history of the world economy development, the effective public debt management has been a basis of the state's financial stability and a guarantee of its sustainable economic growth.

This work examines the peculiarities, causes and consequences of the dynamics of the public debt of Ukraine and its structure, as well as the level of its credibility and sustainability in the period from 2009 to 2022. The aim of the research is to develop measures to improve the level of public debt credibility and sustainability through its management and maintain the stability of public finances of Ukraine in wartime conditions and during post-war recovery period. The main tasks of the study are: to describe the concepts and analyse essences of "public debt" and "public debt management"; to study the dynamics of changes in the amount of the public debt of Ukraine, main reasons and consequences of it; to analyse the main influencing macroeconomic factors on the public debt dynamics as well as the strength and nature of their impact; to define the level of debt credibility and sustainability in Ukraine and develop recommendations on its improvement through public debt management. Method of data collection for master thesis is secondary data collection from government reports, statistical data, strategic vision statements, policy documents, international agreements. Methods of data analysis in the study are systematic analysis of the scientific literature, documents and content analysis; descriptive and statistics methods; correlation and regression analysis; structural analysis; historical retrospective analysis; comparison; methods of tabular and graphic analysis. Instruments of data analysis in the research are vertical and horizontal statistical data analysis; indicators analysis and integral indicators calculation; econometric modelling.

As a result of the analysis, it was determined that the full-scale invasion of Russia on the territory of Ukraine and the related economic challenges significantly worsened both the absolute and relative indicators of the public debt and other main macroeconomic indicators bringing them to critical levels. In the process of constructing and assessment of the multiple linear regression model, it was determined that the state budget deficit and the exchange rate of the national currency have a statistically significant effect on the dynamics of the public debt of Ukraine.

Based on the results of the conducted research, it was determined that during the war, the most important tasks of the government of Ukraine are the restructuring and postponement of public debt repayment and maintenance, ensuring the maximum control over the borrowed funds as well as the reduction of the budget deficit. On the other hand, in the period of post-war reconstruction, it is necessary to increase the amount of internal borrowing through the development of the domestic financial market, to implement the economic and institutional reforms, to employ the active measures for exports stimulation and sound amount of international reserves accumulation, to attract the financial grants from the international financial organizations and partner states to rebuild the infrastructure.

ANNEXES

ANNEX 1

Dynamics of the GDP of Ukraine for 2009-2022 based on yearly average exchange rate, mm US$

	GDP
2009	124608
2010	136012
2011	163160
2012	175781
2013	183310
2014	133504
2015	91031
2016	93356
2017	112190
2018	130902
2019	153930
2020	156618
2021	199766
2022	160503

ANNEX 2

Ratings and compliance scales of the world's leading rating agencies for state sovereign debt

MOODY'S		STANDARD &POOR'S		FitchRatings		Rating description
Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	
Aaa	P-1	AAA	A-1+	AAA	F1+	Prime
Aa1		AA+		AA+		High grade
Aa2		AA		AA		
Aa3		AA−		AA−		
A1		A+	A-1	A+	F1	Upper medium grade
A2		A		A		
A3	P-2	A−	A-2	A−	F2	
Baa1		BBB+		BBB+		Lower medium grade
Baa2	P-3	BBB		BBB	F3	
Baa3		BBB−	A-3	BBB−		
Ba1	Not Prime	BB+	B	BB+	B	Non-investment grade speculative
Ba2		BB		BB		
Ba3		BB−		BB−		
B1		B+		B+		Highly speculative
B2		B		B		
B3		B−		B−		
Caa1		CCC+	C	CCC+	C	Substantial risks
Caa2		CCC		CCC		
Caa3		CCC−		CCC−		
Ca		CC		CC		Extremely speculative
		C		C		Default imminent
C		RD	D	DDD	D	In default
/		SD		DD		
/		D		D		

ANNEX 3

World debt relief initiatives

"Brady's Plan"	In March 1989, US Treasury Secretary Nicholas Brady launched the debt relief program. Its essence was the large-scale debt restructuring of 16 middle-income countries, 11 of which were in Latin America. Private creditors agreed to write off part of the debts (on average 35%) of the debtor countries; instead, they receive special bonds from debtors that could be traded freely. 30-year US Treasury securities issued specifically for the implementation of the Brady Plan were used as collateral. In general, the Brady Plan worked quite successfully: about 60 billion US$ were written off to the participating countries. debts, and within 5 years after the settlement of debt issues, the country collectively received 210 billion US$ capital inflow - before that, almost all countries observed an outflow of financing and investments.
"Heavily Indebted Poor Countries" (HIPC)	The HIPC initiative targets the world's poorest countries, which have been systematically in a state of debt crisis that has impaired their governments' ability to finance key sectors such as education and health. During the years of activity of the initiative since 1996, full or partial cancellation of debt was granted for a total amount of 76 billion US$. (on average 65% of debts) to 37 countries, 31 of which are in Africa.
"Multilateral Debt Relief Initiative" (MDRI)	In 2006, within the paradigm of the HIPC initiative, a new MDRI program was launched, organized by the G8 countries. MDRI became an extension of HIPC: it was agreed to cancel the debt for the countries in need for 55 billion US$, another 5 billion US$ was allocated to the program by the IMF.