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ABSTRACT

Dedicated to the study of the possibility of using the signal approach to determine the level and assess financial security. It is noted that early warning systems based on qualitative analysis, econometric modeling and non-parametric models based on the approach are called upon to identify threats, identify accumulated and possible imbalances, in order to further level the effect of factors that can undermine the financial security of the country. To predict the emergence of threats to the financial condition of Ukraine, a regression model of the growth rate of the Consolidated Budget of Ukraine (as an indicator of the public finances of Ukraine) was developed and proposed, which reflects the dependence of the probability of a decrease in this indicator on a number of security indicators, and its approbation was carried out for the conditions of Ukraine. The selected set of indicators for identifying threats to the financial security of Ukraine provided the basis for building and forming a base of scenarios for the possible behavior of the economy under the influence of external factors for 2022–2023. The authors have identified corrective measures of economic policy on the part of macroeconomic regulation bodies in order to stop the inertial development of the forecast situation.

KEYWORDS

Financial security, financial impact, financial system, threat to the financial security of the state, causes of threats to the financial security of the state, indicator for assessing the level of financial security, signal approach, regression model.

5.1 ESSENTIAL CHARACTERISTICS OF FINANCIAL SECURITY AND THE NEED TO ENSURE IT

The key link in the economic security of any country in the world is its financial security. This is of particular importance in the context of the globalization of economic imbalances, because external control and the use of financial means of penetration can provide violent pressure on the elected state. Financial security is the key to conducting an independent financial and economic policy of the country.

At the macro level, financial security is the ability of the state in peacetime and in emergency situations to adequately respond to internal and external negative financial influences [1]. Financial security reflects the readiness of the country's financial system for timely and reliable financial

support of economic needs in amounts sufficient to maintain the necessary level of economic and military security of the country.

However, the emergence of modern economies inevitably leads to an increase in threats to financial security. Even with the achievement of sustainable development goals in many countries, financial crises have become systematic.

That is why the search for tools for forecasting and assessing the level of threats to the financial security of the country, and if they occur, for further response measures, is becoming of great relevance.

The threat to financial security implies the potential for such a development of events in which, under the influence of various factors (or their combination), there is a danger of destruction of key parts of the financial system, its management system, damage to national wealth and, as a result, the danger of loss of sovereignty. Studies [2, 3] are devoted to attempts to classify threats to the financial security of the country.

In the **Table 5.1**, the authors attempted to generalize the classification of financial security threats.

◆ **Table 5.1** Classification of threats to the financial security of the country

Classification sign	Elements of a classification feature
Depending on residency	Internal
	External
Depending on the action in time	Permanent
	Temporary
Depending on the degree of impact on financial security	Main
	Minor
Depending on recognition capabilities	Explicit
	Hidden
Depending on the attitude to threats	Objective
	Subjective

Source: compiled by the authors based on these sources [2, 3]

Let's agree with the opinion [4–7] that among the main causes of threats to the financial security of the state, the following should be singled out (**Table 5.2**).

The issue of determining the components of financial security remains relevant. Modern scientific opinion [3, 7] identifies the following components of the financial security of the state: budgetary, tax, debt, financial security of the banking system, currency, monetary security, investment security and security of the non-banking financial sector.

● **Table 5.2** The main causes of threats to the financial security of the state

The main causes of threats to the financial security of the state	the rapid development of the process of globalization of the world economy
	the rapid development of the process of interpenetration of foreign policy into the domestic policy of states dependent on world finance
	a constant increase in the huge mass of capital both in individual states and in international organizations, the mobility of which creates a tense situation
	the growing influence of transnational banks and companies on the national economies of individual countries
	high mobility of financial markets as a result of the rapid development of information technology
	high dependence of the public sector of countries on foreign short-term speculative capital, which increases their vulnerability
inability of international financial institutions to effectively control the emergence of threats in the financial sector	

Source: compiled by the authors based on these sources [4–7]

It is possible to investigate the nature and causes of threats to the financial security of the country and obtain a risk prevention mechanism using model testing.

5.2 JUSTIFICATION OF THE EXPEDIENCY OF USING THE SIGNAL APPROACH TO DETERMINE THE LEVEL AND ASSESS FINANCIAL SECURITY

Early warning systems based on qualitative analysis, econometric modeling and non-parametric models based on the signal approach are called upon to identify threats, identify accumulated and possible imbalances, in order to further level the effect of factors that can undermine the financial security of the country. The main advantage of the signaling approach lies in the ability of the predictive power of each predictor indicator to individually assess the level of threat to the country's financial security [8]. In this case, it is important to identify and justify a set of indicators that are hypersensitive to sudden changes – this is what requires a qualitative analysis. The signal approach makes it possible to determine the indicative limits of fluctuations that characterize resistance to threats to financial security. Econometric modeling based on regression models allows comparison between countries and highlights potential risks.

Within the framework of this approach, it is possible to build a model for diagnosing the danger of monetary security (**Fig. 5.1**).

The structural-logical model presented by the authors has three components:

- a mechanism for the formation of space for the study of the level of financial security;
- a table of indicators and their threshold values used to identify external and internal imbalances;

– a thorough review with the calculation of an integral indicator, the purpose of which is to determine the status of a potential imbalance – adjustable at an early stage or problematic – and developing measures for further response to the results.

The metrics/indicators selected for the Scoreboard (table/dashboard) were selected based on the following principles:

- 1) certain indicators are grouped according to the areas of occurrence of threats to financial security;
- 2) certain indicators provide reliable signals about potential imbalances and threats to financial stability;
- 3) certain indicators are intuitive, have a clear economic interpretation, which makes them the most suitable for use by responsible persons in the field of financial security management;
- 4) certain indicators can be calculated on the basis of statistical data for different countries, which ensures the comparability of the results obtained;
- 5) certain indicators are able to reflect both short-term negative changes and the gradual accumulation of such changes in the long term.

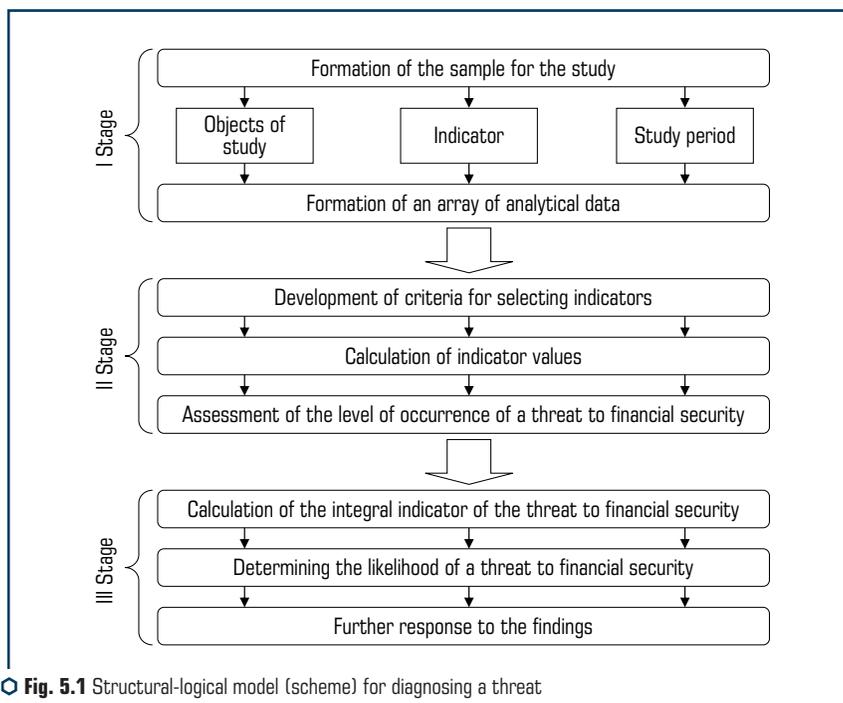


Fig. 5.1 Structural-logical model (scheme) for diagnosing a threat to the financial security of the state

Source: developed by the authors

The classification of indicators – harbingers of financial instability can be presented in the following categories (**Table 5.3**).

The indicators indicated in **Table 5.3** and their threshold limits, of course, cannot fully reflect all the threats to the country's financial security.

● **Table 5.3** Scoreboard (table/dashboard) for assessing the level of financial security of the state

Components of the financial security of the state	Indicators	Threshold limits for indicator changes
Fiscal security	Government budget deficit/surplus ratio to GDP, %	no more than 3
	Level of GDP redistribution through the consolidated budget, %	no more than 25
	The ratio of the volume of aggregate payments for servicing and repayment of the public debt to the state budget revenues, %	no more than 6
Debt security	Ratio of total government debt to GDP, %	no more than 60
	Ratio of total external debt to GDP, %	no more than 25
	Ratio of domestic debt to GDP, %	no more than 30
Monetary security	Level of monetization of the economy, %	no more than 50
	Inflation rate (until December of the previous year), %	no more than 107
	Volume of cash, %	no more than 4
	The level of the average interest rate of loans of banking institutions in relation to inflation, %	no more than 5
Currency security	Ratio of volumes of deposits in foreign currency to total volumes of deposits, %	no more than 25
	The rate of change of the index of the official exchange rate of the hryvnia to the dollar USA to the indicators of the previous period, %	no more than 6
	Ratio of loans in foreign currency to total loans, %	no more than 25
	Coverage ratio of international reserves of the state of the monetary base, %	at least 100
Investment security	Ratio of investment growth rates to GDP growth rates, times	2–32
	Volume of foreign direct investment, % of GDP	at least 5
	Expenses for scientific and technical activities, % of GDP	at least 2
Banking security	Share of foreign banking capital in total banking capital, %	no more than 30
	The volume of lending by banks to the real sector of the economy, % of GDP	at least 30
	The level of doubtful debts in the loan portfolio, %	no more than 10
Security of the non-banking financial sector	Share of long-term insurance in the total volume of collected insurance premiums, %	at least 30
	Level of insurance payments, %	at least 30
	Yield of domestic government bonds, %	3-4
	Share of coverage of domestic public debt by government securities, %	no more than 80

Source: compiled by the authors based on these sources [3, 9, 10]

This gives us the opportunity to assert that there is no universally recognized list of the main macroeconomic indicators for assessing the level of financial security of the state, and issues related to the algorithm for diagnosing and regulating the level of financial security of the country are insufficiently covered. In this regard, there is a need to search for the existing positive practice of building early warning indicators in order to assess the feasibility of using them for making managerial decisions.

5.3 THE RESULTS OF USING THE SIGNAL APPROACH TO DETERMINE THE LEVEL AND ASSESS FINANCIAL SECURITY

Tables 5.4–5.10 present the indicators of the given indicators in order to determine macroeconomic imbalances in Ukraine and Poland (calculations were made on the basis of official data from the Ministry of Finance of Ukraine, the NBU, the State Statistics Service of Ukraine, the Central Statistical Office of Poland, the People's Bank of Poland, the Ministry of Finance of Poland).

● **Table 5.4** Indicators of fiscal security of Ukraine and Poland, % of GDP

Years	The ratio of the state budget deficit/surplus to GDP, % (threshold value – no more than 3)		The ratio of redistribution through the consolidated budget, % (threshold value – no more than 25)	
	Ukraine	Poland	Ukraine	Poland
2006	-0.7	-3.5	24.8	39.3
2007	-1.1	-1.9	23.0	40.8
2008	-1.3	-3.6	24.5	40.1
2009	-3.9	-7.3	22.9	39.3
2010	-5.9	-7.4	22.2	38.1
2011	-1.8	-5.0	23.9	38.7
2012	-3.8	-3.8	24.6	39.8
2013	-4.5	-4.2	23.3	39.3
2014	-5.0	-3.6	22.8	39.5
2015	-2.3	-2.6	27.0	38.2
2016	-2.9	-2.4	25.7	37.7
2017	-1.6	-1.5	26.6	39.0
2018	-1.7	-0.2	26.1	40.8
2019	-1.9	-0.7	25.1	40.3
2020	-5.2	-6.9	25.7	44.2
2021	-3.6	-1.9	23.8	42.4

Source: compiled by the authors based on these sources [11–13]

Data in **Table 5.4** shows that the ratio of the state budget deficit to Ukraine's GDP in 2009–2014 exceeded the optimal value by up to 3 percentage points, while in 2015–2019 this indicator stabilized. This indicates that in recent years the volume of GDP has grown significantly with an almost unchanged level of the budget deficit. In the Republic of Poland, we observe a similar situation in terms of this indicator of fiscal security: after the aggravation of problems in 2008–2014, when the deficit imbalance increased to a dangerous level, during 2015–2021 the value of the indicator corresponded to the threshold value (**Fig. 5.2**).

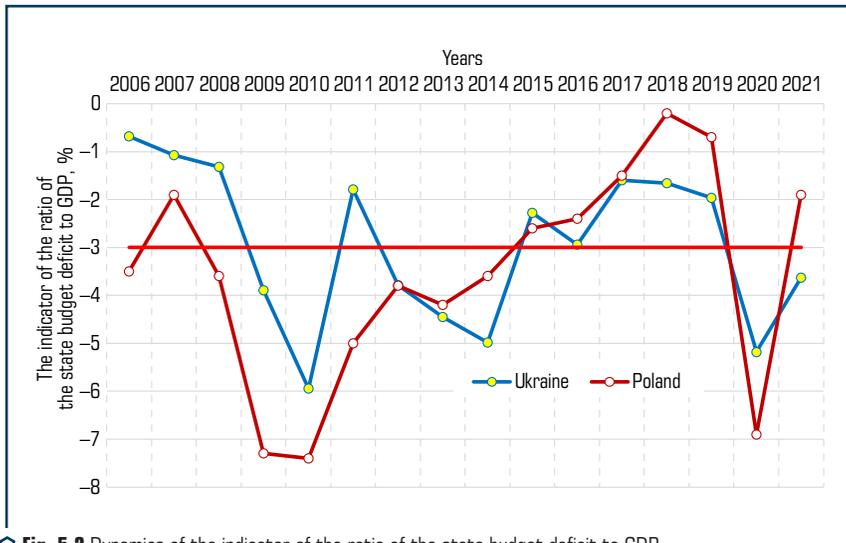


Fig. 5.2 Dynamics of the indicator of the ratio of the state budget deficit to GDP in 2006–2021 in Ukraine and Poland, %

During the entire period under study, there is a balancing on the verge of the limiting value of such an indicator of budgetary security as the level of redistribution of Ukraine's GDP through the consolidated budget. The level of redistribution of Ukraine's GDP through the consolidated budget for 2015–2020 remains at the level as exceeding the limit. During this period, the indicator fluctuated between 25–27 % (**Fig. 5.3**).

However, in Poland, on the contrary, this indicator did not meet the threshold during 2006–2021. This indicates the presence of certain problems in the fiscal sphere both in Ukraine and in Poland, which have accumulated in recent years and are of a systemic nature, lead to a decrease in the stimulating and social function of the tax system, as well as exacerbation of problems in customs and tax administration. The analyzed indicators testify to the insufficient stability of public finances and, as a result, threats to financial security.

Debt security indicators speak about the level of public debt (**Table 5.5**).

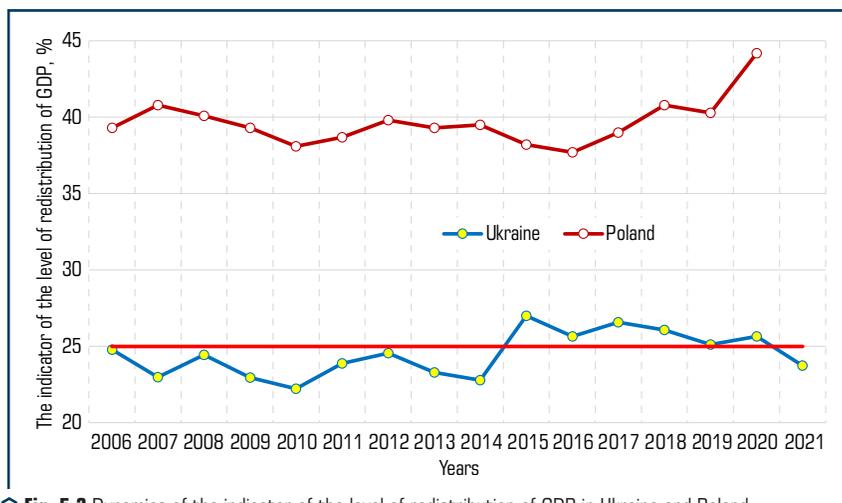


Fig. 5.3 Dynamics of the indicator of the level of redistribution of GDP in Ukraine and Poland through the consolidated budget to GDP in 2006–2021, %

Table 5.5 Main indicators of debt security of Ukraine and Poland, % of GDP

Years	The ratio of the total amount of public debt to GDP, % (threshold value – no more than 60)		The ratio of the total volume of external debt to GDP, % (threshold value – no more than 25)	
	Ukraine	Poland	Ukraine	Poland
2006	14.8	47.3	50.6	9.4
2007	12.3	44.5	56.0	9.7
2008	19.9	46.7	56.5	11.3
2009	34.7	49.8	88.2	11.5
2010	40.0	53.5	86.0	15.0
2011	36.6	54.7	77.4	16.8
2012	36.7	54.4	76.8	16.2
2013	40.1	56.5	77.5	16.7
2014	70.2	51.1	95.8	17.7
2015	79.4	51.3	131.0	17.5
2016	81.0	54.2	121.7	19.1
2017	71.8	50.6	103.9	17.3
2018	60.9	48.8	87.7	17.2
2019	50.3	45.6	79.2	16.1
2020	60.8	57.1	80.8	17.0
2021	48.9	53.8	64.1	16.9

Source: compiled by the authors based on these sources [11, 12]

The state of debt security in Ukraine and the results of determining the main indicators of Ukraine's debt security indicate that the limiting optimal values are exceeded by several times, which leads to the conclusion that Ukraine's debt security is threatened.

During the period under review, there is a negative trend regarding the stability of the indicator of the ratio of Ukraine's total external debt to GDP in 2006–2021. In no year did the value of the indicator meet the threshold value. In 2006–2008 the indicator fluctuated between 50–56 %, since 2009 there has been a significant increase due to the consequences of the global economic crisis (**Fig. 5.4**). A gradual increase has been taking place since 2014, when the figure exceeds the norm by 70 % (95.8 %), which is caused by the armed aggression of the Russian Federation against Ukraine and the need to find additional funds to finance the conduct of hostilities and the maintenance of the armed forces. In 2015–2017 there is a sharp increase in the indicator, which increases to the level of 121.7 % in 2017 and continues to acquire a critical value until 2021 inclusive.

The values of the indicator of the ratio of total public debt to GDP repeat the direction of movement of the values of the ratio of the ratio of total external debt to GDP, starting from 2014 (**Fig. 5.5**). The reasons for the deviations are caused by the above factors – the country is actively confronting the threats of military conflict. The opposite trend in the values of debt security indicators in Poland are given in **Table 5.5**. Analytical data testify to the balanced policy of the government of the Republic of Poland regarding external borrowing, the formation of a debt policy in comparability with the volume of the state's GDP. However, it should be noted that the country does not have military threats (such stability is achieved due to its membership in NATO).

Indicators of monetary security also signal domestic imbalances in financial security (**Table 5.6**).

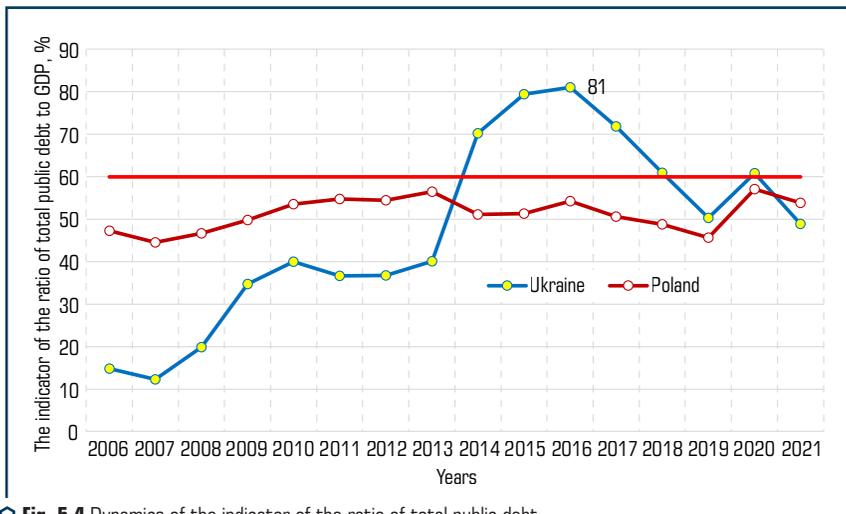


Fig. 5.4 Dynamics of the indicator of the ratio of total public debt to GDP in Ukraine and Poland in 2006–2021, %

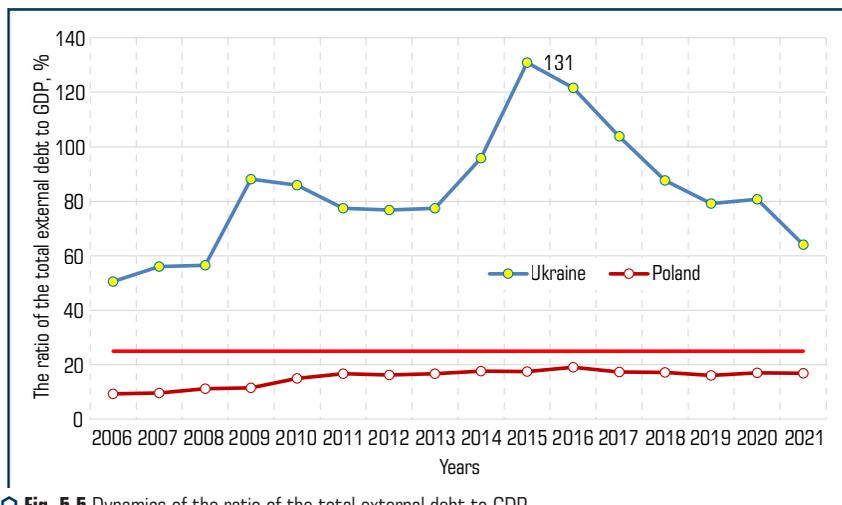


Fig. 5.5 Dynamics of the ratio of the total external debt to GDP of Ukraine and Poland in 2006–2021, %

Table 5.6 Main indicators of monetary security of Ukraine and Poland, %

Years	The monetization rate of the economy, % (threshold value – no more than 50)		The inflation rate (until December of the previous year), % (threshold value – no more than 107)	
	Ukraine	Poland	Ukraine	Poland
2006	48.1	46.3	111.6	101.4
2007	55.0	47.3	116.6	104.0
2008	54.4	51.8	122.3	103.3
2009	53.4	52.5	112.3	103.5
2010	54.6	54.2	109.1	103.1
2011	52.1	56.3	104.6	104.6
2012	54.9	56.8	99.8	102.4
2013	62.5	59.4	100.5	100.7
2014	61.1	61.9	124.9	99.0
2015	69.5	64.1	143.3	99.5
2016	54.2	67.9	112.4	100.8
2017	46.2	66.6	113.7	102.1
2018	39.3	68.2	109.8	101.1
2019	36.2	68.3	104.1	103.4
2020	44.1	77.9	105.0	102.4
2021	38.2	75.7	110.0	108.6

Source: compiled by the authors based on these sources [11, 12, 14, 15]

As **Table 5.6** shows, the monetization rate of the Ukrainian economy, measured by the ratio of the monetary aggregate m^3 to GDP, has been falling since 2017. Saturation of the economy with money is not always a bad factor, since it contributes to the revival of the economy, although there is a risk of inflationary processes (2006–2010).

In 2014–2015 The National Bank of Ukraine announced an inflation targeting policy, which contributed to the return of the indicator of the level monetization rate of the economy to the threshold values. In 2019, it was the lowest – 36 % of GDP, inflation rate – 104.1 % (**Fig. 5.6**).

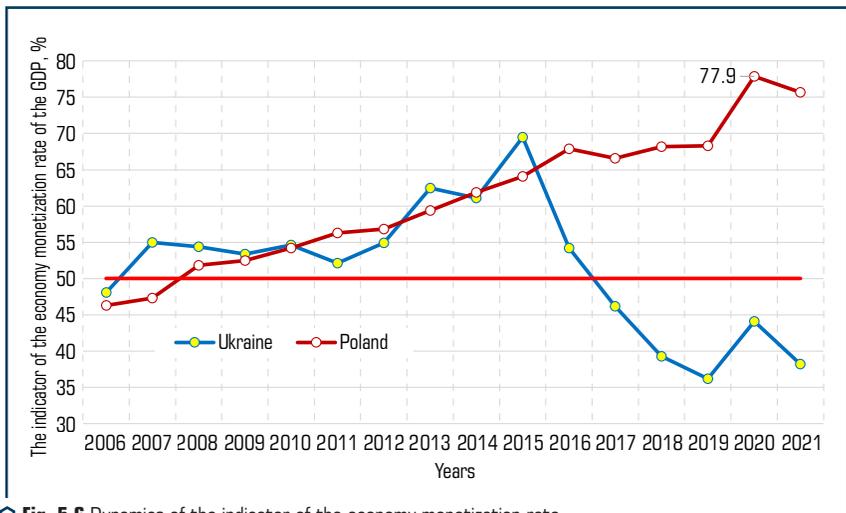


Fig. 5.6 Dynamics of the indicator of the economy monetization rate of the GDP of Ukraine and Poland in 2006–2021, %

Such a low level of monetization of the national economy has become one of the factors of its low dynamism and adaptability, because money is the «blood» of the economic organism. Such a policy led to the emigration of the labor force, the lack of renewal of the country's fixed capital, the degradation and narrowing of the country's industrial base. The level of filling the economy with money from the National Bank is extremely low, if we compare it with the Republic of Poland.

The People's Bank of Poland, since 2008, maintains a high level of monetization of the economy, because it does not pose a threat to inflation if the issue of money has a proper commodity coverage. In confirmation of this thesis, the inflation index in Poland is observed at the level of certain threshold values (**Fig. 5.7**).

Let's consider the existence of a threat to the currency security of Ukraine and Poland (**Table 5.7**).

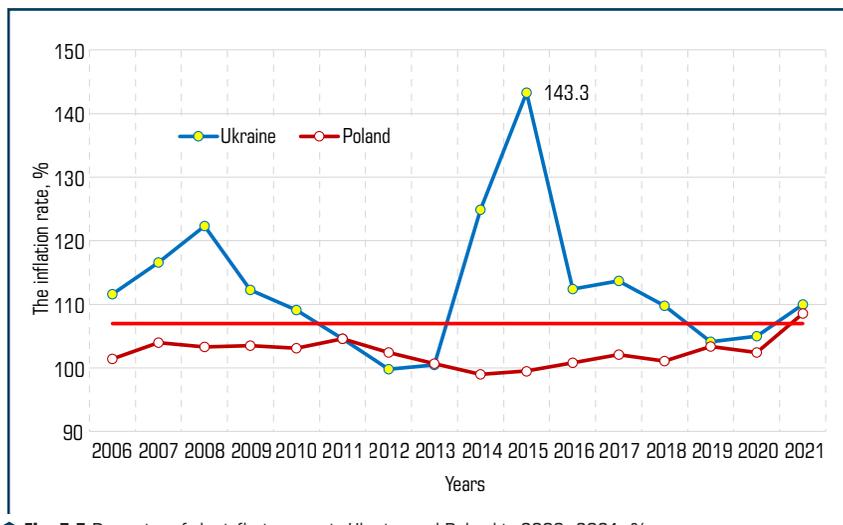


Fig. 5.7 Dynamics of the inflation rate in Ukraine and Poland in 2006–2021, %

Table 5.7 Main indicators of currency security of Ukraine and Poland, %

Years	Coverage ratio of the international reserves of the state of the monetary base, % (threshold value – not less than 100)		Ratio of volumes of deposits in foreign currency to total volumes of deposits, % (threshold value – no more than 25)	
	Ukraine	Poland	Ukraine	Poland
2006	116.14	162.52	38.08	19.09
2007	115.59	155.93	32.26	17.12
2008	89.05	145.76	43.89	12.50
2009	108.35	164.98	48.32	7.22
2010	121.64	198.38	42.56	17.86
2011	105.64	242.13	42.97	18.16
2012	76.83	201.90	44.04	18.24
2013	53.11	195.07	37.05	13.05
2014	26.89	183.83	45.87	13.23
2015	86.49	174.52	45.32	18.13
2016	104.05	216.82	46.26	8.75
2017	125.38	170.01	45.38	8.63
2018	131.39	150.52	42.05	7.32
2019	136.98	160.47	40.02	6.73
2020	131.79	150.92	37.68	7.30
2021	127.45	161.31	32.37	7.72

Source: compiled by the authors based on these sources [11, 12]

Table 5.7 gives an idea of the threats to the currency security of Ukraine and Poland.

The value of indicators of currency security in Poland indicates the absence of manifestations of imbalances in the periods under review. The country has sufficient gold and foreign exchange reserves, which has a positive impact on the stability of the Polish national currency, the absence of the threat of devaluation (**Fig. 5.8**). As a result, confidence in the Polish zloty and a low level of deposits held in foreign currency. The level of international reserves of Ukraine is confirmed by significant fluctuations during the periods under review, incl. and as a result of two crises (2008–2009 and associated with the Russian invasion in 2014).

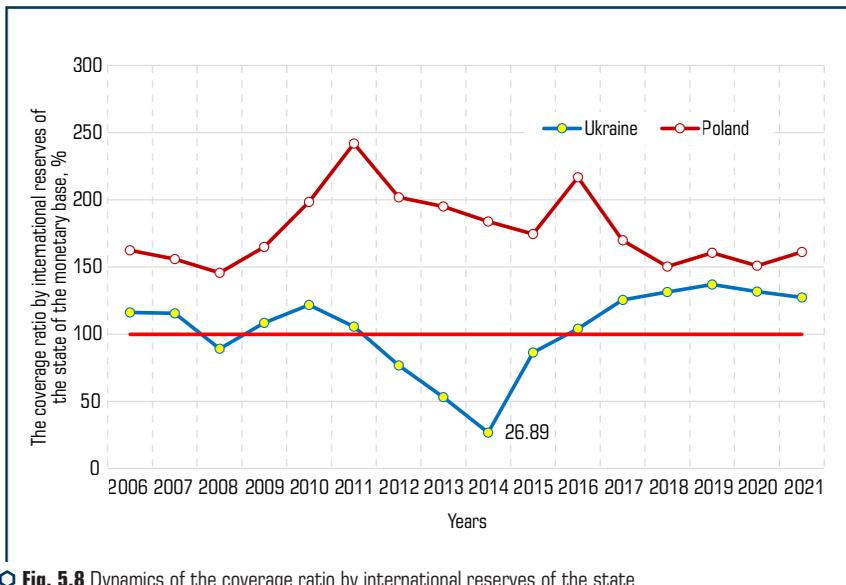


Fig. 5.8 Dynamics of the coverage ratio by international reserves of the state of the monetary base of Ukraine and Poland in 2006–2021, %

Destructiveness in the management of international reserves negatively affects the exchange rate of the national currency, which fuels the threat of devaluation and makes it necessary to keep savings in more stable currencies, such as the dollar and the euro. However, given the fact that individuals in Ukraine will not abandon hard currency deposits in the near future, banks will have no choice but to continue to attract them (**Fig. 5.9**).

Let's explore the component of the country's financial security – investment security as a characteristic of the country's ability to reproduce the scientific, technical and intellectual potential of the nation, to carry out expanded reproduction of fixed capital, to maintain the competitiveness of the economy (**Table 5.8**).

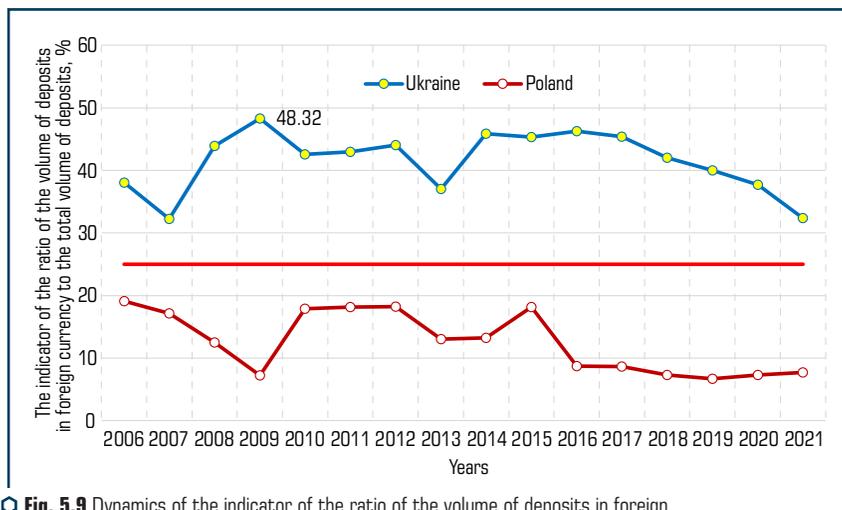


Fig. 5.9 Dynamics of the indicator of the ratio of the volume of deposits in foreign currency to the total volume of deposits in Ukraine and Poland in 2006–2021, %

Table 5.8 Main indicators of investment security of Ukraine and Poland, % of GDP

Years	The volume of foreign direct investment, % of GDP (threshold value – at least 5)		Expenditure on scientific and technical activities, % of GDP (threshold value – at least 2)	
	Ukraine	Poland	Ukraine	Poland
2006	5.2	15.5	0.98	0.56
2007	6.9	15.3	0.93	0.62
2008	6.1	15.2	0.90	0.63
2009	4.1	15.0	0.85	0.64
2010	4.8	14.8	0.75	0.72
2011	4.4	14.9	0.65	0.75
2012	4.8	14.6	0.67	0.88
2013	2.5	14.0	0.70	0.87
2014	0.3	14.7	0.60	0.94
2015	-0.5	15.1	0.55	1.00
2016	4.1	13.1	0.48	0.96
2017	3.3	13.0	0.45	1.03
2018	3.4	14.3	0.47	1.09
2019	3.8	14.0	0.43	1.16
2020	-0.6	13.2	0.41	1.22
2021	3.2	12.8	0.40	1.29

Source: compiled by the authors based on these sources [11, 12]

Investment security indicators characterize the degree of manifestation of the corresponding threats. One of the most important indicators characterizing the degree of development of the country is the volume of foreign direct investment in GDP. During the analyzed period, this indicator of Ukraine had a «safe» value only in 2006–2008 – 5.2–6.9 % and tends to decrease, which indicates insufficient investment in fixed assets and the inability to provide the necessary material and technical base for needs of the economy In contrast to Ukraine, in Poland this indicator adhered to the threshold value (**Fig. 5.10**).

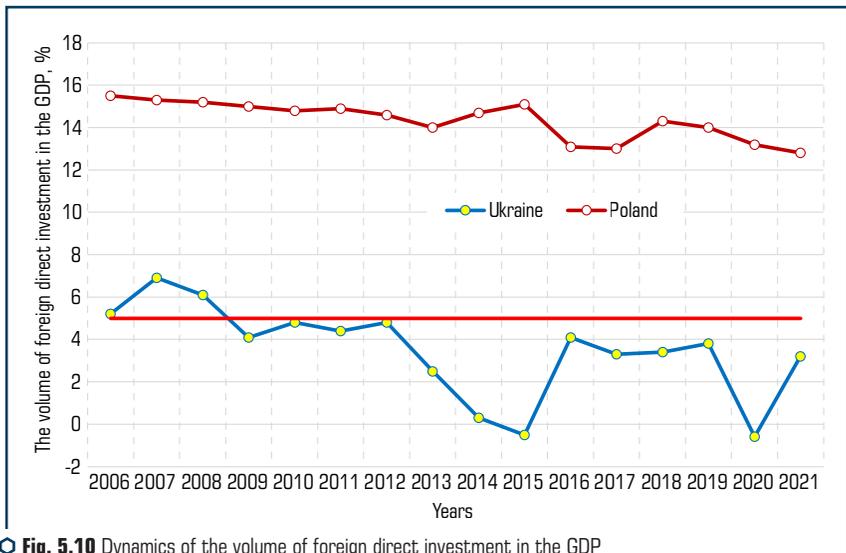


Fig. 5.10 Dynamics of the volume of foreign direct investment in the GDP of Ukraine and Poland in 2006–2021, %

Speaking about the costs of scientific and technical activities in Ukraine and Poland (**Fig. 5.11**), we observe deviations from the threshold value of the indicator, and the lack of funds to finance the state order for the most important scientific and technical (experimental) developments and putting the country’s scientific and technical products in dependence on imports of advanced technologies from countries such as China, the United States of America, Japan.

Let’s assess banking security as a component of the country’s financial security (**Table 5.9**).

Analytical data in **Table 5.9** testify to a significant part of foreign banking capital in the total volume of Poland’s banking capital, which in this case is a positive moment and indicates the active integration of the banking sector into the European space. However, for Ukraine, which is not a member of the European Union, the presence in the banking market of a significant share of banks with foreign capital may carry various risks and threats. These risks are associated with insufficient competition of domestic banks compared to foreign ones, which have cheap resources of parent banks and much greater opportunities to use them, as well as exchange rate fluctuations

both in the world and in Ukraine, with the possibility of potential influence of non-residents on decision-making, for example, on the choice of lending facilities in Ukraine (Fig. 5.12).

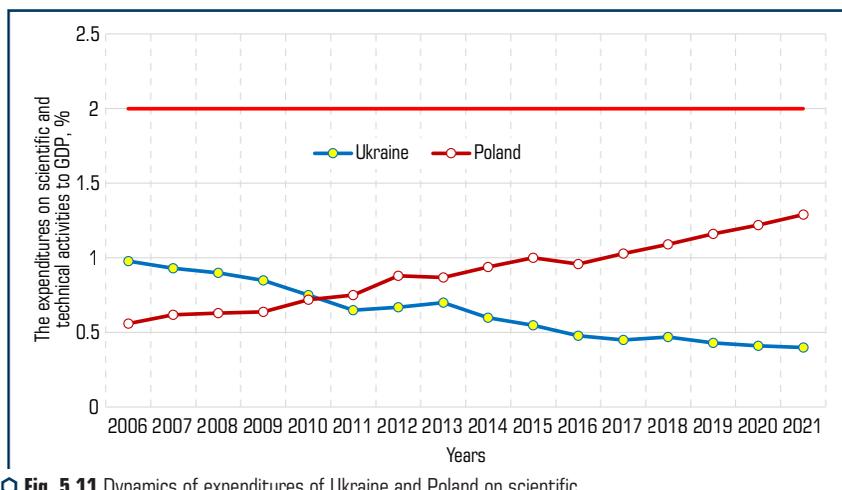


Fig. 5.11 Dynamics of expenditures of Ukraine and Poland on scientific and technical activities to GDP 2006–2021, %

Table 5.9 Main indicators of banking security in Ukraine and Poland, % of GDP

Years	The share of foreign bank capital in the total volume of bank capital, % (threshold value – no more than 30)		The volume of lending by banks to the real sector of the economy, % of GDP (threshold value – at least 30)	
	Ukraine	Poland	Ukraine	Poland
2006	27.6	69.5	30.8	30.5
2007	35.0	71.1	38.3	36.3
2008	36.7	72.3	49.8	22.0
2009	35.8	70.5	52.0	22.1
2010	40.6	68.4	47.1	22.0
2011	41.9	65.0	44.4	21.6
2012	39.5	63.6	43.4	23.5
2013	34.0	63.2	49.2	25.3
2014	32.5	61.5	51.6	26.5
2015	43.3	59.0	40.8	28.2
2016	37.8	56.6	35.1	17.9
2017	29.2	55.1	28.3	17.8
2018	28.2	51.9	24.6	17.9
2019	28.7	48.9	19.2	16.9
2020	28.1	47.3	17.6	16.3
2021	28.0	46.2	14.2	14.7

Source: compiled by the authors based on these sources [11, 12, 15–18]

By the end of 2021 The National Bank of Ukraine has created an optimal share of banks with foreign capital in the structure of the banking system, which reduces the risk of the state's financial security. However, such actions by the regulator limited the volume of resources for lending to the real sector of the national economy, and since 2017, the activity of Ukrainian banks in ensuring economic growth has been declining. A similar situation is taking place in the Republic of Poland: since 2008, the volume of lending by banks to the real sector of the economy has tended to decrease (Fig. 5.13). However, this situation is caused by the significant activity of transnational groups, developing the real sector of the Polish economy at their own expense.

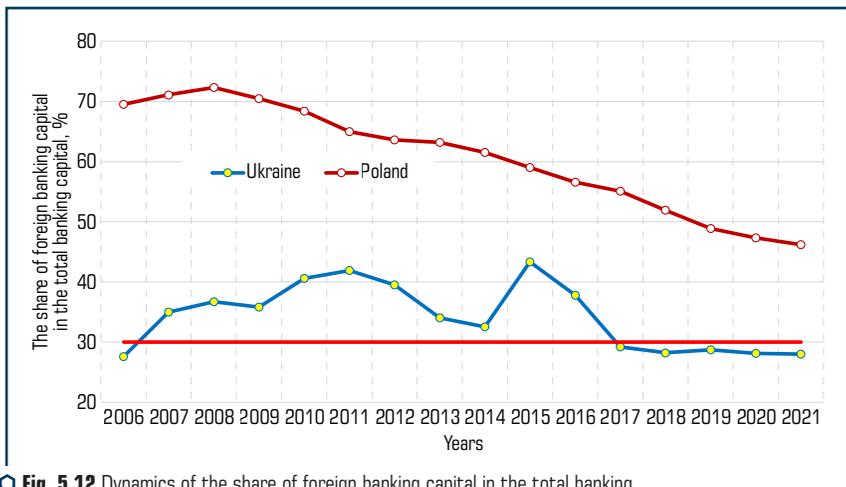


Fig. 5.12 Dynamics of the share of foreign banking capital in the total banking capital of Ukraine and Poland in 2006–2021, %

Let's assess the security of the non-banking financial sector as a component of the country's financial security (Table 5.10).

The insurance market, along with the banking market, is the most developed in all countries of the world. This situation is due to the accumulation of significant financial flows through insurance premiums and the socio-economic role played by insurance companies in society and the economy. However, we see that the insurance market in Ukraine is underdeveloped, as evidenced by the low levels of insurance payments during the analyzed periods (Fig. 5.14). This means a high probability of the transfer of compensation for insured events, especially in the healthcare sector, at the expense of public funds, which does not create conditions for improving the country's budgetary security. However, as we see from the example of Poland, the development of the insurance market does not pose a threat to the financial security of the country.

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Fig. 5.13 Dynamics of lending by banks to the real sector of the economy of Ukraine and Poland in GDP 2006–2021, %

Table 5.10 Main security indicators of the non-banking financial sector of Ukraine and Poland, %

Years	Level of insurance payments, % (threshold value – not less than 30)		Yield of an internal government loan bond, % (threshold value – 3–4)	
	Ukraine	Poland	Ukraine	Poland
2006	18.8	44.8	9.26	4.20
2007	23.4	44.9	6.71	5.30
2008	29.4	49.9	11.86	6.25
2009	32.9	78.2	12.21	4.75
2010	26.4	67.8	10.39	4.00
2011	21.4	69.7	9.17	4.50
2012	23.9	63.8	12.94	3.90
2013	16.2	63.6	13.13	3.00
2014	18.9	62.2	13.98	2.20
2015	27.2	63.6	13.07	2.00
2016	25.1	65.6	9.16	2.00
2017	24.3	63.9	10.47	2.10
2018	24.8	67.0	17.79	2.10
2019	27.5	64.3	16.93	2.10
2020	33.5	62.5	10.20	1.00
2021	37.9	59.7	11.34	1.00

Source: compiled by the authors based on these sources [11, 12, 15, 18, 19]

The high level of social responsibility of the state leads to an increase in the state budget deficit and requires the search for resources to cover it and ensure financing of the necessary state

budget expenditures. As a result, Ukraine is forced to attract the necessary financial resources in the domestic market, stimulating the activity of economic entities with a high level of profitability, which we observe during the analyzed periods (Fig. 5.15). This situation creates additional threats to the debt security of the state. At that time, Poland, which has the opportunity to use the resources of the European Union, ensuring a high economic level of growth, during the periods under review, optimized the cost of raising funds in the domestic market.

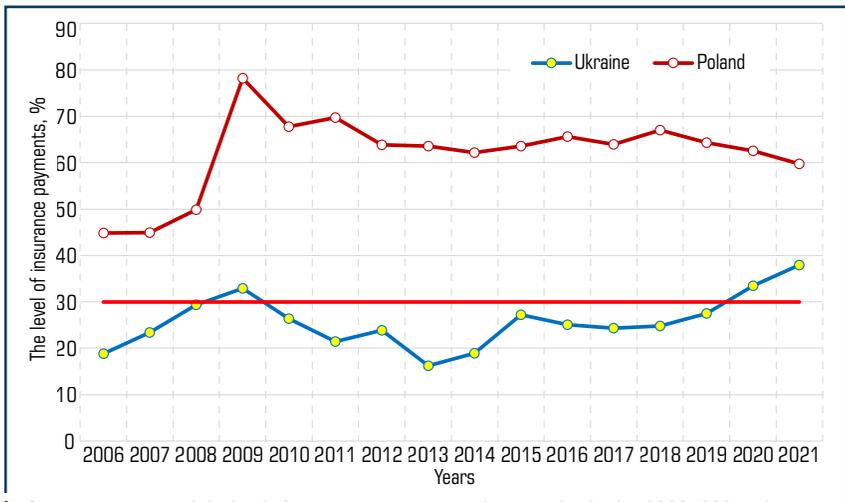


Fig. 5.14 Dynamics of the level of insurance payments in Ukraine and Poland in 2006–2021, %

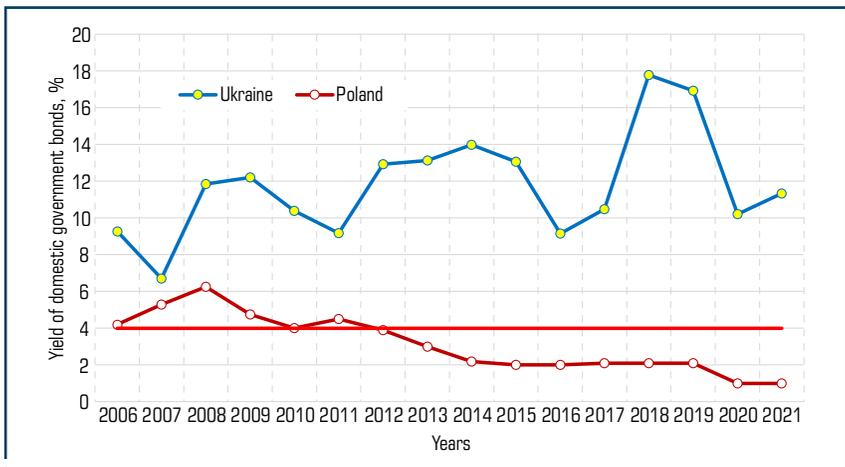


Fig. 5.15 Yield dynamics of domestic government bonds of Ukraine and Poland in 2006–2021, %

Thus, based on the foregoing, it can be stated that the level of security of the non-banking financial sector of Ukraine is critical. In general, during 2006–2021, in Ukraine, at the same time, four out of fourteen indicators assessing the components of the level of financial security signaled the presence of threats (**Tables 5.5, 5.7, 5.8, 5.10**). The rest with different duration of periods showed deviations from the optimal values. More often, periods of such deviations occurred in the period 2014–2020, which were associated with the crisis of the Russian invasion in the spring of 2014 and the subsequent post-crisis period. The NBU did not achieve the stability of the national currency, which undermined its credibility and provoked an increase in the dollarization of the national economy. There was an increase in external debt. The country's financial system is not capable of protecting national interests and is dependent on external influence.

5.4 JUSTIFICATION OF THE ALGORITHM AND THE RESULTS OF USING A REGRESSION MODEL WITH PERFORMANCE INDICATORS IN ORDER TO PREDICT THREATS TO THE FINANCIAL CONDITION IN THE FUTURE ON THE EXAMPLE OF UKRAINE

In order to foresee threats to the financial condition of Ukraine, a regression model has been developed for the dependence of the growth rate of the Consolidated Budget of Ukraine (as an indicator of Ukraine's public finances) on such factors as the deficit/surplus ratio of the state budget; the ratio of the total public debt; inflation rate; coverage ratio by the international reserves of the state of the monetary base; the amount of lending by banks to this sector of the economy (5.1).

$$Y_{CBGR} = -165.65 + 0.129X_{SBDSP} - 0.22X_{RTPB} + 0.979X_{IR} + 0.529X_{CMB} + 0.998X_{BLRSE} \quad (5.1)$$

The selected set of indicators for identifying threats to the financial security of Ukraine provides the basis for building and forming a base of scenarios for the possible behavior of the economy under the influence of external factors. In fact, the value of these indicators by the end of the period, in the absence of other corrective influences (in particular, the government's macroprudential policy), determines the response and stability of public finances during a crisis. The authors predicted the growth rate of the Consolidated Budget of Ukraine, which makes it possible to assess the process of the spread of crisis phenomena for the public finances of Ukraine over the next two years after the analyzed period.

Let's calculate a certain regression model (5.1) for Ukraine using Microsoft Excel tools. The data for calculations are presented in **Table 5.11** (the values of the indicators that exceeded the corresponding threshold values are shaded). The presented model (5.1) has rather high indicators of its evaluation: Multiple $R=0.92$, $R^2=0.84$.

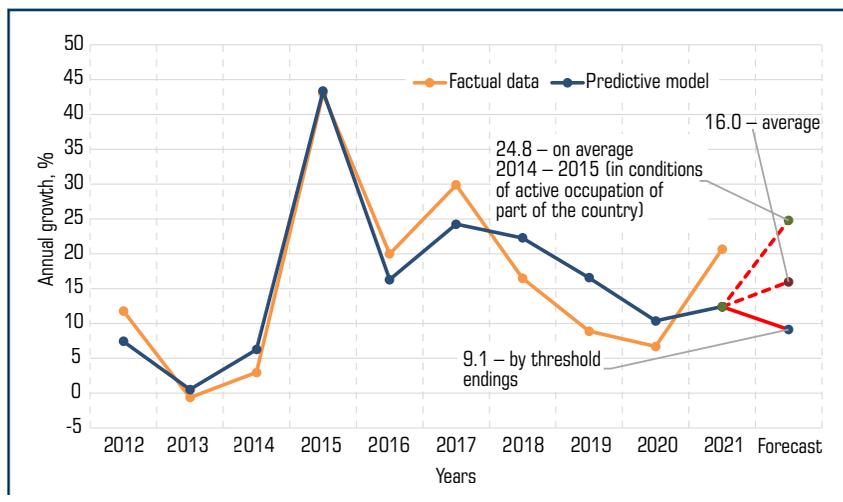
The results of the implementation of model (5.1) are shown in **Fig. 5.16**.

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● **Table 5.11** Initial data for calculating the regression model with performance indicators reflecting the dependence of Ukraine's public finances on a number of security indicators

Indicator	Government budget deficit/surplus ratio	The ratio of total public debt	Inflation rate	Coverage ratio by the international reserves of the state of the monetary base	The volume of lending by banks to the real sector of the economy	Growth rate of the Consolidated budget
Presentation format	% of GDP	% of GDP	%	%	% of GDP	annual growth, in %
Conventions	SBDSR	RTPB	IR	CMB	BLRSE	CBGR
Thresholds	no more than 3	no more than 60	no more than 107	at least 100	at least 30	
2012	-3.8	36.7	99.8	76.83	43.4	11.8
2013	-4.5	40.1	100.5	53.11	49.2	-0.6
2014	-5.0	70.2	124.9	26.89	51.6	3.0
2015	-2.3	79.4	143.3	86.49	40.8	43.0
2016	-2.9	81.0	112.4	104.05	35.1	20.0
2017	-1.6	71.8	113.7	125.38	28.3	29.9
2018	-1.7	60.9	109.8	131.39	24.6	16.5
2019	-1.9	50.3	104.1	136.98	19.2	8.9
2020	-5.2	60.8	105.0	131.79	17.6	6.7
2021	-3.6	48.9	110.0	127.45	14.2	20.7

Source: developed by the authors



○ **Fig. 5.16** Results of the implementation of the model (5.1), variants of the CBGR forecast

There are three forecast options:

1. All indicators of the model (X_i) will be equal to their threshold values, namely: $X_{SBDSR}=3$; $X_{RTPB}=60$; $X_{IR}=107$; $X_{CMB}=100$; $X_{BLRSE}=30$; in this case, the forecast value of the growth rate of the Consolidated Budget of Ukraine will be 9.1 (+/-8 %).

2. Model indicators (X_i) will be equal to their average values for the study period 2012–2021, namely: $X_{SBDSR}=-3.25$; $X_{RTPB}=60.01$; $X_{IR}=112.35$; $X_{CMB}=100.036$; $X_{BLRSE}=32.4$; in this case, the forecast value of the growth rate of the Consolidated Budget of Ukraine will be 16 (+/-8 %).

3. This version of the forecast is based on the assumption of a repetition of the behavior of the financial system during the active occupation of part of the country's territory by the Russian aggressor in 2014–2015. Therefore, the indicators of the model (4.1) will be equal to their average values for the period 2014–2015, namely: $X_{SBDSR}=-3.65$; $X_{RTPB}=74.8$; $X_{IR}=134.1$; $X_{CMB}=56.69$; $X_{BLRSE}=46.2$; in this case, the forecast value of the growth rate of the Consolidated Budget of Ukraine will be 24.8 (+/-8 %).

The forecasting results for 2022 (**Fig. 5.16**) make it possible to determine the scenarios for the movement of the trajectory of the growth rates of the Consolidated State Budget of Ukraine. Taking into account the situation, starting from February 24, 2022, martial law has been in effect on the territory of Ukraine related to the military aggression of the Russian Federation, one should take into account the forecast option based on the assumption of a repetition of the behavior of the financial system during the active occupation of part of the country's territory by the Russian aggressor in 2014–2015. According to forecasts, in 2022 Ukraine will improve the growth rate of the Consolidated Budget of Ukraine, however, its growth will be caused by the need to cover significant defense spending, devaluation of the national currency. This situation will continue to put pressure on the national currency, causing devaluation processes, reducing the volume of bank lending to the real sector of the economy, the ability of the private sector to act as a source of investment in the economy, including through financial intermediaries, and increasing the need for additional resources from international financial organizations and international assistance.

However, the inertial development of the forecast situation can be stopped by corrective measures of economic policy on the part of macroeconomic regulation bodies, namely:

- resumption of cooperation with the IMF and EBRD;
- development of measures aimed at ensuring the protection of the national interests of Ukraine in the conditions of increased protectionism of other countries, as well as in emergency situations;
- development of a common Ukraine-EU roadmap for the further development of trade and economic ties;
- carrying out further reforms in the field of tax and land policy, active transition to new production standards (in order to increase the competitiveness of domestic products in the context of the need to develop the markets of the European Union);

- use of various forms of public-private partnership in the context of a significant increase in investment activity, which, among other things, will improve the situation on the labor market;
- rapid implementation of the relocation program (transfer to safer territories) of production facilities.

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