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INTERCONNECTIONS ASSESSMENT OF BANKING CAPITALIZATION WITH MACROECONOMIC STABILITY, INCLUDING CORRUPTION AND SHADOW ECONOMY

The research focuses on bank capitalization and macroeconomic stability, including corruption and the shadow economy. A well-capitalized banking system and a low corruption level are important for maintaining macroeconomic stability and reducing the size of the shadow economy. The paper is aimed at assessing the relationship between bank capitalization and macroeconomic stability, which includes corruption and shadow economy through canonical analysis. The research is conducted on the basis of financial and economic reporting of 35 countries with different levels of socio-economic development during 2010–2021 based on data from the World Bank and the European Central Bank. The main input blocks macroeconomic stability – corruption – shadow economy are characterized.

During the research, the following tools were used:

– methods of grouping, analysis and comparison in determining the characteristics of the elements of the chain «level of capitalization of the banking system – macroeconomic stability – corruption – shadow economy»;

– factor analysis by applying the method of principal components in the selection of statistically significant indicators of the bank capitalization level and macroeconomic stability.

The quantitative assessment of the bank capitalization level revealed the following dependencies: there is a strong correlation between return on assets and the level of non-performing loans, return on assets and return on equity. Using the principal components method, the following statistically significant indicators of macroeconomic stability were identified: GDP, Gini index, corruption perception index, corruption control index, and political stability index.

Research, based on the canonical analysis, determined that 71.1 % of changes in macroeconomic stability indicators are explained by fluctuations in the level of bank capitalization. The level of non-performing loans has a negative impact on macroeconomic stability, while the volatility of return on assets and return on equity has a greater positive impact on the development of the country's economy.

The obtained results can be used by banks in the development of their resource and management policies, in the analysis of the volatility of capitalization level, by state bodies in the development of national policies of the country's economic development.

Keywords: *macroeconomic stability, capitalization, banking system, corruption, shadow economy, canonical analysis.*

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1. Introduction

Achieving and maintaining financial and price stability is the key to the economic growth of any country. Effective monetary policy and a low and stable level of inflation are the main tools of this development. One of the indicators of monetary policy is the aggregate capital ratio, which had a downward trend in the third quarter of 2022. The indicator ranged from 12.48 % in Spain to 24.06 % in Estonia. It is worth noting that as of the end of 2022, HSBC Holdings PLC 124 % (Great Britain), BNP Paribas 64 % (France), UBS Group 60.3 % (Switzerland) occupied the leading positions in terms of capitalization [1]. Also, these countries were among the top 10 countries with the most developed economies in the world as of the end of 2021. The GDP of Great Britain was 3.3 % of the world level, France – 3.1 %, and Switzerland – 0.9 % [2]. Gross domestic product is one of the catalysts for the growth of the country's economy. GDP measures the total market value of final services and goods produced by the state over a certain period of time. By comparing the volume of the indicated indicator, it is possible to determine the richest and most developed countries in the world. According to the above, the banking sector has a direct connection with macroeconomic stability.

Today, it is important to take into account a number of inhibitory indicators that hold back the country's financial and economic development and have largely subjective characteristics. These are the indicators that determine the state of corruption and the shadow economy in the state. They exert a significant disincentive indirect influence on both the banking system and economic processes as a whole. Accordingly, as a result, they destabilize the macroeconomic situation. Weak rule of law, money laundering, falsification of bank statements, corruption at high levels of government, lending to customers on instructions, lending to related parties on a large scale, abuse of management in the bankruptcy procedure and foreclosures are the main manifestations of corruption and shadowing in the banking sector. This restrains the adequate and effective development of the national economy of the state.

The issue of assessing the impact of the banking system capitalization on macroeconomic stability, which includes corruption and the shadow economy, requires a more detailed qualitative and quantitative study.

Scientists from different countries of the world were studying the connection between the bank capitalization and macroeconomic stability. These concepts were studied to a greater extent as separate sectors of the economy. The issue of bank capitalization and its connection with other sectors of the economy was studied in [3–5] and others. Features, components and main indicators of macroeconomic stability were determined in works [6–10] and others.

[3] analyzes the development of the banking system of Ukraine in the context of state participation in the capital of banks. The author substantiates the negative consequences of increasing foreign capital in the banking system. The scientist notes that the bank's capital is an indicator of the «health» and reliability of the institution, financial protection against external and internal shocks.

In [4], the study reflects the macroeconomic causes of banking instability. The authors find that interest rates, inflation, bank lending growth and equity prices tend to be indicators of changes in overall banking volatility in the UK. Thus, scientists confirmed the existence of a connection between banking activity and macroeconomic stability, but did not consider aspects of capitalization.

In [5], the authors considered anticyclical capital rules for small open economies. Researchers demonstrate that proactive use of countercyclical capital regulation – in the form of Basel III-type rules – can help mitigate boom-bust cycles caused by overly optimistic expectations. Accordingly, a sufficient level of bank capitalization is a guarantee of the country's stability during economic crises.

In contrast to studies of the banking sector, in [6] the definition of the concept of macroeconomic stability is given as a complex interaction of indicators of economic growth of the country: the volume of GDP, the level of inflation and unemployment, but did not take into account subjective destabilizing factors of influence, among which corruption and shadowing of the national economy. Also [7] describes the volatility of the shadow economy as a destabilizing economic factor over the past 20 years.

The study [8] reflects the modeling of macroeconomic instability as a result of the interaction between the accumulation of government debt and the «state of confidence» of various business entities. The authors believed that tight fiscal policy is likely to be destabilizing because it contributes to falling spending, output, and «the state of confidence». On the other hand, traditional monetary policy may not cope with macroeconomic instability. A flexible fiscal policy can become the basis for increasing the share of the shadow economy.

It is worth noting that the instruments of stabilization of the macroeconomic situation of the country were singled out, among which the targeting of nominal GDP growth rates was singled out [9]. In contrast, the rate of profit is defined as a measure of monopoly power [10], which is a characteristic of a non-competitive market environment and, as a result, destabilization of the country's economy through the spread of corruption processes.

According to the above, the question of assessing the relationship between the bank capitalization and macroeconomic stability, which includes the factors of corruption and shadowing, is insufficiently researched and requires a more in-depth study.

The aim of research is to assess the relationship between bank capitalization and macroeconomic stability, which includes corruption and the shadow economy.

2. Materials and Methods

The assessment is based on data from 35 countries during 2010–2021.

The following tools were used during the research:
- methods of grouping, analysis and comparison when determining the characteristics of the elements of the chain «level of capitalization of the banking system – macroeconomic stability – corruption – shadow economy»;
- factor analysis by applying the method of principal components in the selection of statistically significant indicators of the level of bank capitalization and macroeconomic stability.

3. Results and Discussion

Today, there is a trend of gradual slowing down of economic growth in various countries of the world. First of all, this is due to a number of such factors:
- post-crisis recovery after the COVID-19 pandemic;
- the weakening of the growth rates of the economies of EU countries: according to the annual ranking of the best countries to live in in 2023, Switzerland took 8th place (in 2022, 4th place) [11], Luxembourg took 9th place (in 2022, 6th place) [12];
- gradual reduction of the «quantitative easing» program by the US Federal Reserve System;
- a full-scale invasion of russia into Ukraine;
- formation of new financial, economic and geopolitical challenges for global economic development as a result of russian aggression.

It should also be noted that one of the main world rankings reflecting the level of economic development of a country is the Ranking of the best countries to live in, which has been calculated by the UN since 2012 [13]. It includes the following factors of state development: GDP per capita, social support, healthy life expectancy, freedom of choice and presence/absence of corruption. The specified indicators partially characterize the macroeconomic situation, which includes factors of corruption and shadowing. In Table 1 shows the Top 10 best countries to live in as of the beginning of 2023 and their socio-political features.

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Table 1

Top 10 best countries to live in as of early 2023 [13]

Place in the 2023 rating	Place in the 2022 rating	Country	Features
1	1	Finland	High trust in the authorities and freedom
2	2	Denmark	– Development of civil society and human rights; – A high level of fiscal autonomy and economic independence
3	3	Iceland	High level of social support of the population
4	9	Israel	The highest level of economic stress resistance during and after the COVID-19 pandemic
5	5	Netherlands	Pro-social policy of the state, which includes health care, assistance to families and material support
6	7	Sweden	High level of citizens' trust in the authorities
7	8	Norway	High level of GDP per capita, social support and freedom of choice
8	4	Switzerland	Stable economy, high wages and stable employment
9	6	Luxembourg	The highest level of GDP per capita
10	10	New Zealand	High level of public health

According to the rating, the positions of the countries in the rating as of 2023 that have improved are highlighted in green, and the ones that have deteriorated in red. Thus, Sweden and Norway rose in the ranking by 1 position in 2023 due to the high level of GDP per capita, the presence of social support and the freedom of choice of the population of the countries. Switzerland and Luxembourg significantly worsened their positions, which is explained by a slight increase in GDP per capita: for the first country – 0.3 % for the first quarter of 2023, for the second – 2 %, and an increase in the unemployment rate.

It is worth noting that inflation fluctuations, volatility of unemployment and GDP volumes have a significant relationship with the stability of the global financial system, which includes the banking systems of various countries of the world.

For a more detailed quantitative and qualitative assessment of the relationship between the bank capitalization and macroeconomic stability, including patterns of corruption and shadowing, it is possible to conduct a canonical analysis based on the data of countries with different levels of socio-economic and financial development.

First of all, it is necessary to form an array of input data, which includes economic and financial reporting of the following countries: Austria, Albania, Belgium, Bulgaria, Denmark, Estonia, Ireland, Iceland, Spain, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Malta, Moldova, the Netherlands, Germany, Norway, Great Britain (United Kingdom), Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Hungary, Ukraine, Finland, France, Croatia, Czech Republic, Switzerland, Sweden and USA from 2010 to 2021. The indexes for the analysis are indicators of the bank capitalization, general indicators of macroeconomic stability, indicators of corruption and the shadow economy (Table 2).

In the next step, it is necessary to normalize the values indicated in the Table 2 indicators by taking into account the indicators-stimulators and destimulators of the state development. Among the disincentives for the bank capitalization, it is necessary to single out the level of non-performing loans, because when it increases, the amount of interest income decreases, then the amount of profits and, as a result, the amount of the bank's equity decreases. Among the disincentives of general indicators of macroeconomic stability, one can single out the inflation rate, which is an indicator of the purchasing power of the national currency, and the unemployment rate, the increase of which increases the burden on the state budget.

After normalizing the input data, it is important to determine statistically significant indicators of the blocks «capitalization of the banking system» and «macroeconomic stability», which includes general indicators of economic development, corruption and the shadow economy. Indicators are selected using the method of principal components, which is a factor analysis tool in the Statistica package.

For a more detailed analysis of the statistical dependence between the capitalization indicators of the banking system, consider matrix correlation graphs that graphically display the density of the relationship between the specified parameters (Fig. 1). The main indicators of the capitalization level of banks are displayed diagonally, and each element of the matrix characterizes the intersection of various parameters. A strong relationship between capitalization indicators is observed if the points on the graph are close to the line.

It is possible to observe a tendency that the closer the points are to the line, the greater the connection between the indicators. Thus, there is a strong relationship between ROA and the level of non-performing loans, ROA and ROE as the points are closer to the line. When the profitability of assets increases by 1 %, the level of non-performing loans decreases by 0.16 %, and when the profitability of equity capital increases, it decreases by 0.27 %. Also, if the return on assets increases by 1 %, the return on equity increases by 0.67 %.

Fig. 2 shows a diagram of the bank capitalization range indicators, which reflects the variability in a statistical sample of capitalization indicators.

Fig. 2 shows significant deviations of the average values and the level of swing of return on equity. There is also a significant range of asset profitability data, which indicates the presence of different approaches to banking regulation in European countries.

Table 3 shows the results of using the method of principal components, which is also aimed at determining statistically significant indicators in the data sample.

As can be seen from Table 3, the cumulative percentage of the total variance reflected by the selected factors is about 70 %, namely: 68.1 %. At the same time, the first factor explains 38.1 % of the total variance, and the second – 30 %. This shows that the variables included in the first factor exert a stronger influence on the bank capitalization. The eigenvalues of these two factors exceed unity. The next stage of determining statistically significant components is the selection of factor loadings (Table 4).

Table 2

Characteristics of general indicators of the banking system capitalization, macroeconomic stability, corruption and the shadow economy (compiled by the authors on the basis of [14–17])

Sphere	Indicator	Designation	Characteristic	Units
Banking system capitalization	Ratio of capital to bank assets	BCAR	It characterizes the general level of capital that ensures active operations of the bank	%
	The level of non-performing loans	NPL	The share of loans that have defaulted in the total volume of the bank's loan portfolio. Increase in NPL – decrease in profit – decrease in capital	%
	Number of bank branches per 1,000 adult population	CBB	It characterizes the possibility of physical access to financial services; manifestation of the operational function of the bank's capital	pcs/1000 person
	Level of depth of financial services	BDtGDP	Ratio of bank deposits to GDP. Increase in level – increase in profit – increase in capital	%
	Profitability of bank assets	ROA	It is determined by the ratio of net profit to the bank's total assets. An increase in the indicator means an increase in capitalization	%
	The level of regulatory capital to risk-weighted assets (Tier 1 rate)	BRC	Regulatory capital adequacy standard. The standard value should be at least 10.5 %	%
	Return on capital	ROE	Financial ratio characterizing the efficiency of the use of own capital	%
	The ratio of bank expenses to income	CIR	It characterizes the level of operational profitability of the bank	%
General indicators of macroeconomic stability	The volume of gross domestic product (GDP)	GDP	The monetary equivalent of the result of the production activity of resident economic units in the field of tangible and intangible production	Thousand USD
	Inflation rate (GDP deflator)	INFLATION	The ratio of the price index of the current period to the price index of the previous period in percentage	%
	Unemployment rate (% of the total labor force)	UNEMPL	The ratio of the number of unemployed to the total number of economically active working population of the country	%
	Gini index	GINI	The indicator represents the gap between the poor and rich sections of the population	In units
	Growth of gross national income per capita	GNI	The growth rate of the total value of goods and services provided to a certain state over a certain period of time	%
Corruption	Primary government expenditures as a share of the initially approved budget	EXPEND	The extent to which the overall result of budget expenditures reflects the originally approved amount, as defined in the government's budget documentation and fiscal reports	%
	Index of perception of corruption	CORRPERC	Indicator of perception of corruption in the public sector	In units
	Indicator of corruption control	CORRCONTR	The extent to which public power is used for private gain, including both petty and grand forms of corruption	In units
	Indicator of political stability and absence of violence/terrorism	POLITSTAB	Measures the perception of the likelihood of political instability and/or politically motivated violence, including terrorism	In units
Shadow economy	Indicator of the law role	LAW	Agents' degree of trust in and compliance with societal rules, quality of contract enforcement, property rights, police and courts, and likelihood of crime and violence	In units
	Indicator of regulatory quality	QUALITY	An indicator of the government's ability to formulate and implement effective policies and regulations that enable and promote the development of the private sector of the economy	In units
	Shadow economy level (% of GDP)	SHADOW	Share of illegal, unofficial legal and formally unregistered activities	%

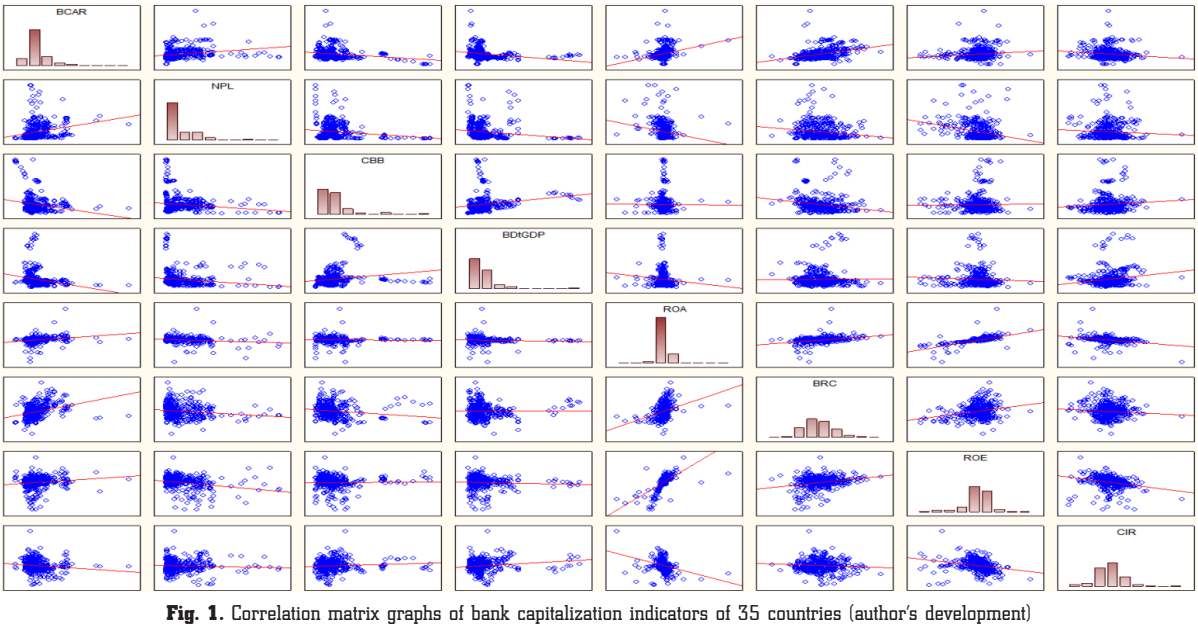

Fig. 1. Correlation matrix graphs of bank capitalization indicators of 35 countries (author's development)

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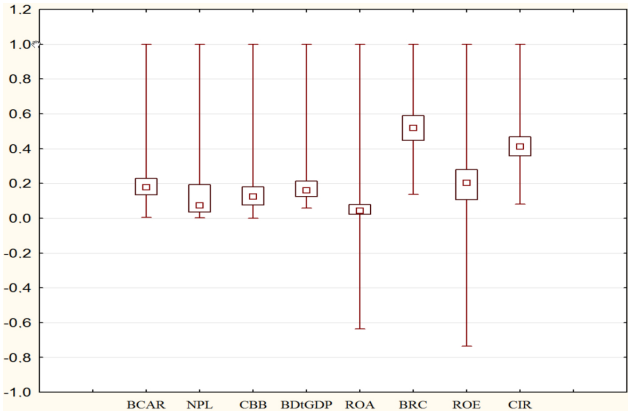

Fig. 2. Swing diagrams (author's development)

Table 3

Eigenvalues and share of total variance for factors formed by indicators of bank capitalization (authors' development)

Factors	Eigenvalues	% of total variance	Cumulative % of total variance
Factor 1	2.249	38.119	38.119
Factor 2	1.600	30.011	68.131

Table 4

Results of using the method of principal components (authors' development)

Indicator	Factor 1	Factor 2
BCAR	–0.518	0.522
NPL	–0.153	–0.718
CBB	0.220	–0.545
BDtGDP	0.277	–0.534
ROA	0.826	0.240
BRC	–0.590	–0.001
ROE	0.747	0.393
CIR	0.489	–0.131
Total variance	2.249	1.600
TV share	38.119	30.011

Thus, the first factor includes those indicators that exert a stronger influence on the bank capitalization. Factor loadings of statistically significant indicators are marked in gray in Table 4. The first factor includes indicators that have a statistically significant impact, such as ROA (0.826) and ROE (0.747), and the second factor includes NPL (–0.718). All the listed indicators have values of factor loadings on the module more than 0.7. Thus, the indicators of the bank capitalization are significant and can be used for canonical analysis.

The next step is to determine statistically significant indicators of macroeconomic stability, which takes into account the factors of shadowing and corruption of the economy. For a more detailed analysis of the statistical dependence between indicators of macroeconomic stability and factors of corruption and the shadow economy, consider the correlation matrix graphs (Fig. 3).

There is a moderate relationship between the volume of GDP and the level of inflation and the level of unemployment, the volume of GDP and the indicator of corruption control, the indicator of political stability and the absence of violence/terrorism, the indicator of the law role, the indicator of regulatory quality and the level of the shadow economy. When the inflation rate increases by 1 %, the volume of GDP decreases by 0.22 %, and when the unemployment rate increases by 38 %, the volatility of which characterizes the general development of the country's economy. When the indicator of corruption control increases by 1 %, the volume of GDP increases by 0.82 %, when the indicator of political stability and absence of violence/terrorism increases by 0.59 %, which reflect fluctuations in corruption processes in the country. When the indicator of the law role increases by 1 %, the volume of GDP increases by 0.78 %, when the indicator of regulatory quality increases by 0.75 %, and when the level of the shadow economy increases by 1 %, the volume of GDP decreases by 0.62 %, which characterizes the state of the shadow economy. economy of the country.

Fig. 4 shows a diagram of the range of indicators of macroeconomic stability, corruption and the shadow economy, which reflects the variability in the statistical sample of indicators of macroeconomic stability with disincentives.

Fig. 4 shows significant deviations of the average values of the GDP volume, the index of perception of corruption, the indicator of corruption control, the indicator of political stability, the indicator of the role of the law and regulatory quality. This characterizes significant differences in the monetary, financial and fiscal policies of countries with different levels of social and economic development. There is also a significant range of data for the Gini index and the indicator of political stability.

For the purpose of a more in-depth selection of statistically significant indicators of macroeconomic stability, which takes into account the factors of corruption and shadowing, it is possible to use factor analysis by applying the method of principal components. The results of the analysis are shown in Table 5.

Переменная	GDP	INFLATION	UNEMPL	GINI	GNI	EXPEND	CORRPERC	CORRCONTR	POLITSTAB	LAW	QUALITY	SHADOW
GDP	1,00	-0,22	-0,38	-0,07	-0,09	0,12	0,81	0,82	0,59	0,78	0,75	-0,62
INFLATION	-0,22	1,00	-0,07	-0,15	0,06	-0,04	-0,36	-0,36	-0,53	-0,40	-0,43	0,46
UNEMPL	-0,38	-0,07	1,00	0,34	-0,09	-0,17	-0,41	-0,38	-0,32	-0,39	-0,40	0,30
GINI	-0,07	-0,15	0,34	1,00	-0,00	-0,08	-0,12	-0,13	-0,13	-0,10	-0,04	-0,08
GNI	-0,09	0,06	-0,09	-0,00	1,00	-0,05	-0,10	-0,12	0,00	-0,11	-0,07	0,03
EXPEND	0,12	-0,04	-0,17	-0,08	-0,05	1,00	0,10	0,11	0,14	0,13	0,09	-0,03
CORRPERC	0,81	-0,36	-0,41	-0,12	-0,10	0,10	1,00	0,99	0,66	0,96	0,91	-0,72
CORRCONTR	0,82	-0,36	-0,38	-0,13	-0,12	0,11	0,99	1,00	0,68	0,97	0,92	-0,71
POLITSTAB	0,59	-0,53	-0,32	-0,13	0,00	0,14	0,66	0,68	1,00	0,73	0,71	-0,64
LAW	0,78	-0,40	-0,39	-0,10	-0,11	0,13	0,96	0,97	0,73	1,00	0,94	-0,75
QUALITY	0,75	-0,43	-0,40	-0,04	-0,07	0,09	0,91	0,92	0,71	0,94	1,00	-0,76
SHADOW	-0,62	0,46	0,30	-0,08	0,03	-0,03	-0,72	-0,71	-0,64	-0,75	-0,76	1,00

Fig. 3. Correlation matrix of dependencies of indicators of macroeconomic stability with elements of corruption and shadow economy (author's development)

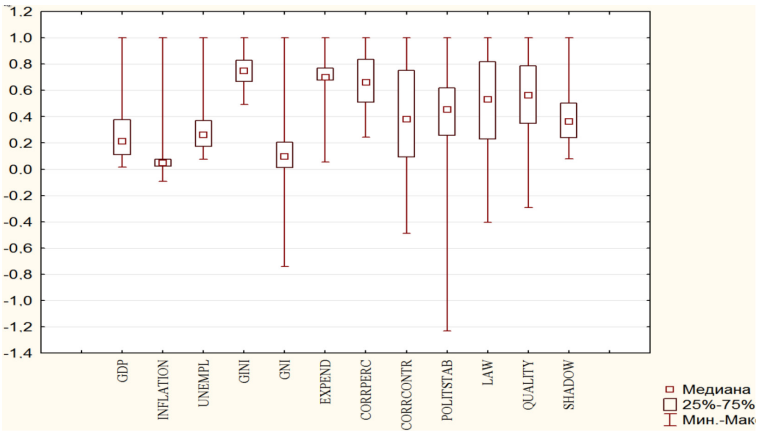

Fig. 4. Swing diagrams (author's development)

As can be seen from the Table 5, the cumulative percentage of the total variance reflected by the selected factors is more than 70 %, namely: 73.5 %. At the same time, the first factor explains 51.2 % of the total variance, and the second – 12.2 %. This indicates that the variables included in the first factor exert a stronger influence on macroeconomic stability. The eigenvalues of these two factors exceed unity. The next stage of determining statistically significant components is the allocation of factor loadings (Table 6).

Thus, the first factor includes those indicators that exert a stronger influence on the macroeconomic stability of the country. Factor loadings of statistically significant indicators are marked in gray in the Table 6. The first factor includes indicators that have a statistically significant impact, such as GDP (0.836), CORRPERC (–0.957), CORRCONTR (–0.962), POLITSTAB (–0.798), LAW (0.970), QUALITY (0.949) and SHADOW (0.814), to the second GINS (0.718). All the listed indicators have values of factor loadings on the module more than 0.7. Thus, the indicated indicators of macroeconomic stability, taking into account corruption and the shadow economy, are significant and can be used for canonical analysis.

On the basis of statistically selected indicators, it is possible to determine the connection between the blocks «level of capitalization of the banking system» and «macroeconomic stability with factors of corruption and shadow economy».

Fig. 5 shows the correlations between samples of the above-mentioned economic blocks.

Удаленный	GDP	GINI	CORRPERC	CORRCONTR	POLITSTAB	LAW	QUALITY	SHADOW
NPL	-0,458239	0,039080	-0,549789	-0,541985	-0,574037	-0,585360	-0,596175	0,675663
ROE	0,091234	-0,116666	0,128507	0,117431	0,192376	0,129082	0,175767	-0,166727
ROA	0,012224	-0,061722	0,038739	0,040678	0,184716	0,035213	0,050323	-0,078556

Fig. 5. Correlations between indicators of the capitalization level of the banking system and the macroeconomic stability of the country (authors' development)

There is a moderate inverse relationship between the level of non-performing loans and the GDP volume. When the amount of non-performing assets increases by 1 %, the GDP level decreases by 0.45 %. It is also possible to identify an inverse relationship between the volume of non-performing loans and the index of perception of corruption, an indicator of corruption control, an indicator of political stability, an indicator of the law role and regulatory quality, and a direct relationship is observed between the level of non-performing loans and the level of the shadow economy. Thus, with the volatility of the level of non-performing loans, the resistance of the processes of detection and control of corruption is broken and the number of enterprises operating in the shadows increases.

It is worth noting that the closeness of the relationship between the canonical quantities is determined by the canonical correlation coefficient R^2, which was 0.711. Thus, 71.1 % of the change in macroeconomic stability indicators of European countries is explained by fluctuations in capital banking indicators. $P<0$, which characterizes the truth of the proposed statement.

Three roots describe 100 % of the variance of the set of capital indicators and 66.8 % of the variance of the set of macroeconomic stability indicators. Using the values of the capital indicators and the obtained canonical roots, it is possible to explain on average 22.1 % of the variance of the variables in the left set and 29.1 % of the variability in the right set.

The canonical function was used for the study:

$$Y = f(x), \quad (1)$$

where x – canonical variables for capitalization characteristics; Y – canonical variables for the characteristics of

Table 5

Eigenvalues and share of total variance for factors formed by indicators of bank capitalization (authors' development)

Factors	Eigenvalues	% of total variance	Cumulative % of total variance
Factor 1	6.151	51.2	51.2
Factor 2	1.473	12.2	73.5

Table 6

Results of using the method of principal components (authors' development)

Indicator	Factor 1	Factor 2
GDP	0.836	0.084
INFLATION	–0.469	–0.566
UNEMPL	–0.458	–0.649
GINI	0.108	0.746
GNI	0.019	–0.157
EXPEND	–0.146	–0.296
CORRPERC	–0.957	–0.033
CORRCONTR	–0.962	–0.032
POLITSTAB	–0.798	0.064
LAW	0.970	0.004
QUALITY	0.949	0.048
SHADOW	0.814	–0.214
Total variance	6.151	1.473
TV share	51.2	73.5

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macroeconomic stability, taking into account corruption and shadow economy.

Next, it is necessary to determine the impact of all capital indicators on indicators of macroeconomic stability and determine the canonical function:

$$0.017 \cdot GDP - 0.110 \cdot GINI - 0.672 \cdot CORRPERC + \\ + 1.010 \cdot CORRCONTR - 0.287 \cdot POLITSTAB + \\ + 0.078 \cdot LAW + 0.357 \cdot QUALITY - 0.669 \cdot SHADOW = \\ = -0.985 \cdot NPL + 0.037 \cdot ROA + 0.072 \cdot ROE. \quad (2)$$

Thus, the level of non-performing loans has a negative impact on macroeconomic stability, and the volatility of the return on assets and the return on equity has a positive effect on the development of the country's economy. Corruption and shadow processes of an internal nature have a significant influence on the general state of the macroeconomic environment, and the level of capitalization of the banking system is an external factor of influence.

To reduce the level of corruption and the shadow economy of any country, it is necessary to develop a number of measures, which will include:

– creation of a special investigative and analytical bureau to investigate financial crimes;
– creation of a database on cases of insolvency and financial fraud to support forensic examination;
– streamlining of laws and regulations on insolvency settlement;
– improvement of the «know your client» procedure and the fight against money laundering in EU banks.

The described measures will help increase the resistance of the world's banking systems in the event of economic turbulence, which, as a result, will affect the stabilization of the country's national economy on the world market.

The mentioned research has scientific and practical significance. From a scientific point of view, the determination of methodological principles for assessing the relationship between the banking system capitalization and macroeconomic stability (taking into account corruption and the shadow economy) is the foundation for further research based on the results of econometric modeling (principal component method, canonical analysis). From a practical point of view, the study of the impact of capitalization on macroeconomic stability is valuable, since the study is based on real data of banks and economic indicators of the development of various countries of the world, and the obtained model allows taking into account the volatility of the specified blocks when developing resource policies of banks and national economic strategies in general.

The research results can be expanded with a list of non-European countries, as well as include other indicators of the capitalization level, which depends on the type of banking system of the country and the methods of formation of bank resources (issuance of securities, conducting deposit operations, obtaining loans on the money market).

It is also worth noting that the resulting model of the relationship between bank capitalization and macroeconomic stability is influenced by the state of war in Ukraine, as there are direct economic losses for global economic stability: the destruction of infrastructure, production facilities, public institutions, the loss of human capital and the expenditure of resources on military confrontation.

The conducted research can become the basis for further research, as the obtained model can be calculated in the future for different groups of countries taking into account World Bank data after February 24, 2022.

4. Conclusions

Based on the research results, the main purpose of which was to assess the relationship between the level of capitalization of the banking system and macroeconomic stability, taking into account corruption and the shadow economy by conducting a canonical analysis, the factors of economic growth of countries were determined, the rating of the best countries for living in 2023 was analyzed in comparison with in 2022.

Based on the application of one of the tools of factor analysis, namely the method of principal components, statistically significant indicators of the capitalization level of banking system were selected: return on assets, return on equity and the level of non-performing loans. It was determined that when the return on capital increases by 1 %, the return on assets increases by 0.67 %. Among the statistically significant indicators of macroeconomic stability, the following are highlighted:

– the volume of GDP, the Gini index, which describe the economic development of the country;
– index of perception of corruption, indicator of corruption control, indicator of political stability, which characterize corruption processes in the country;
– the indicator of the law role, the indicator of regulatory quality, the level of the shadow economy, which determine the normative and actual component of the shadow economy.

Based on the conducted canonical analysis, it was determined that 71.1 % of the change in indicators of macroeconomic stability is explained by fluctuations in the level of bank capitalization. Thus, the level of non-performing loans has a negative impact on macroeconomic stability, and the volatility of the return on assets and the return on equity has a positive effect on the development of the country's economy to a greater extent. The obtained results can be used both by banks during the development of resource policies, at the level of state management of banking systems. as well as in the development of the national economic strategy of the state.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

The manuscript has no associated data.

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