

Comparative Characteristics of the Banking Sector in Eastern Europe

Irina Tarasenko¹, Volodymyr Saienko², Alisa Kirizleyeva³,
Kristina Vozniakovska⁴, Liudmyla Harashchenko⁵, Olena Bodnar⁶
dok.melnuchyk83@ukr.net

¹Kyiv National University of Technologies and Design, Ukraine

²Academy of Management and Administration in Opole, Ukraine

³Chernivtsi Law Institute National University “Odessa Law Academy”, Ukraine

⁴Chernivtsi Law Institute National University “Odessa Law Academy”, Ukraine

⁵Kyiv National University of Culture and Arts, Ukraine

⁶Mykolayiv National Agrarian University, Ukraine

Summary

This article is devoted to the comparative characteristics of the banking sector in Eastern Europe. The paper's central purpose is to summarize data on the functioning and development of the banking sector in Eastern Europe, based on historical background and current state of the banking sector, finding typical features and differences between the banking sectors of Eastern Europe. Methods of statistical analysis and systematization are used in determining the field of research. Methods of economic analysis, particularly the main indicators of banking activity compared to macroeconomic indicators, are used to assess the efficiency of the banking sector. Comparative characteristics of the banking sector are performed using cluster analysis, k-means algorithm. According to the study results, it can be concluded that the countries of Eastern Europe have different backgrounds in the formation of the banking system, which affects the current state of banking. The study collects, sorts, compares, and summarizes data on the number of banking institutions in Eastern Europe, the size of their assets, lending, deposits, equity formation. These indicators are compared with the macroeconomic indicator of GDP, which determines the importance of the banking sector in the real economy. According to the cluster analysis results, it is divided into four groups of common features of the Eastern European country according to some banks' activity indicators. Banks of EU member states are formed mainly by foreign investment, while state funds finance banks of the CIS countries. As a result, banks with foreign investment have more influence on the economy. They support and develop it, while banks with public investment have significantly less effect on the economy, which does not allow it to grow faster.

Key words: *banking sector, banking system, Eastern European countries, cluster analysis.*

1. Introduction

The banking sector has a special place in each country. In the countries of Eastern Europe, which are formed mainly by the countries of the post-Soviet space, it was pretty challenging to reform the banking system at a rapid pace.

After the collapse of the Soviet Union, it was necessary to re-create regulatory organizations that formed the banking legislation and adjusted the banking sector's work to help create sufficiently competitive conditions to serve

the economy and find a reliable investor in the banking sector.

Today, 30 years after the collapse of the Soviet Union, many countries have failed to do so, and their banking system is still not ready to provide reliable financial support. Still, it can only organize cash flow between financial services users.

In other Eastern European countries that are now part of the European Union or countries that plan to join it, the banking sector has developed steadily with the development of the European banking system. Due to the large financial investments of Western European banks and other developed countries, it can accelerate economic growth by offering businesses favorable lending conditions. The population, in turn, has the opportunity to trust banks and therefore save and accumulate money.

The study aims to summarize data on the development and current state of the banking sector in Eastern European countries and their comparative analysis to identify common features, differences, and directions for developing the banking sector in developing countries.

2. Literature review

The banking sector is the driving force of any developed economy. That is why it is natural that the history, condition, weaknesses, and prospects of the banking sector are the objects of research of many researchers, economists, financiers, and scientists (Bayar et al., 2021). However, before exploring the banking sector, we need to determine what it is. Some scholars (Orluk, 2003; Prylutskiy, 2008; Bayar et al., 2021; Abuselidze, 2021) believe that the banking sector is a component of the credit system within a single financial system for a certain period. In practice, it is not possible to define the banking sector as an activity of banking organizations in a particular state rather, it is a more complex mechanism that includes some interrelated elements, including a set of banking institutions, infrastructure, banking market, legislation, and so on.

The banking sector's specificity is determined by a number of interrelated elements and the relationships between them.

Speaking of the regulation and organization of the banking sector in Eastern Europe, we can consider several good examples. In particular, the banking system is a part of the state's financial system, and it is regulated at the legislative level. Most countries have a two-tier structure: National Banks and commercial structures form it. This is the banking sector structure in Hungary, which is formed by the National Bank of Hungary, credit and financial organizations (Dvorák, 2001). The Polish banking system is also formed by the National Bank of Poland, banks, and credit financial institutions. In Slovakia, the Czech Republic, Russia, Belarus, and Ukraine, the main bank is also the National Bank, with banks and credit financial institutions at the second level. (Sidak & Bysaga, 2006; Palečková & Vodová, 2021). Credit institutions form the second banking system level. For many EU member states or associate members of the EU, an essential step in developing the banking system was the creation of a single EU market based on the White Paper and the Single European Act 1985. This is where the rule-making activities of states in the direction of harmonization of legislation began (Grůň, 1998; Tomášek, 1997).

The principle of checks and balances and the legislative division of functions underlies the two-tier banking system of developed countries. It is also historically proven that the lower the central bank's dependence on the state, the lower the inflation rate in the country (Abuselidze, 2021; Kočenda & Iwasaki, 2020). The same principles are used in developed countries such as Switzerland, Germany, and others (Erpyleva, 1998; Tosunyan, 2002).

A significant amount of research is devoted to the comparative analysis of banking systems in different countries (Syed, 2021; Shala & Toçi, 2021; Christopoulos et al., 2020). This practice allows us to identify certain typical features and patterns of development, the possible effects of banking on each other, and learn from countries successful experiences the decisions that improve banking regulation and banking sector activity (Butzbach et al., 2020). The reports of the Central Banks for 2016-2020 of these countries were applied to obtain data on the banking sector development in Eastern European countries. The study also elicited information on key macroeconomic indicators, reviews of experts and specialists in the banking sector on the main problems and prospects of its activities.

3. Research methods

In order to obtain scientific results, general scientific research methods such as analysis, synthesis, induction, and deduction were used. Information was collected by

statistical method. The main concern of information collection was the systematization of data on objects and fields of research.

Today, there are different approaches to determining the list of countries belonging to Eastern Europe. In this study, we will rely on the UN classification according to the quotas of the regional representation of member states. However, the formation of such groups often violates the geographical principle, for instance, Western Europe includes Australia, New Zealand, Israel. In contrast, Eastern Europe includes Azerbaijan, Armenia, and Georgia, which are of Asian descent (UN, 2021). Thus, the Eastern European group, according to the UN classification, includes Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Montenegro, Northern Macedonia, Poland, the Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, and Ukraine.

However, other classifications, such as statistical (Statistical Yearbook, 2019), show that Eastern Europe includes ten countries. The list is as follows: Belarus, Bulgaria, Hungary, Moldova, Poland, Russia, Romania, Slovakia, Ukraine, Czech Republic. As stated above, these are the countries of the former Soviet Union. It should be noted that the financial sector of these countries has developed approximately equally, which indicates that they can be combined into one statistical group for research. That is why the statistical analysis that will be conducted for the countries of Eastern Europe will be based on this method (Statistical Yearbook, 2019).

To evaluate the work of banking institutions, methods of financial analysis of banking institutions are used. In particular, the resulting indicators that assess the performance of the banking sector are the number of banking institutions, the size of total assets of all banks by country, the share of assets in GDP, lending, deposits, equity formation. In order to compare the banking sector of Eastern European countries, methods of comparison, averages, and clustering are used.

K-means is a simple, repeatable clustering algorithm that divides a large set of data into groups relative to a given number of clusters k . The k-means algorithm has historically been one of the most important data mining algorithms. The algorithm operates on the principle of minimizing the total quadratic deviation of cluster points from the centers of these clusters (Centroid - points that are the centers of clusters). In clustering algorithms, the grouping of points is done by selecting similar features for the most part. The k-means algorithm uses the measure of proximity - Euclidean distance.

$$V = \sum_{i=1}^k \sum_{x_1 \in S_1} (x_j - \mu_i)^2 \quad (1)$$

where k – number of clusters;

x_j – each vector represented by a point $i = 1, 2, \dots, k$;

S_i – obtained clusters;

μ_i – centers of mass of vectors x_j (Centroids).

K is the central value from the algorithm's input data and is set by the researcher manually or randomly each time. The k-means algorithm minimizes the final square of the Euclidean distance between each vector x_j and a similar point of the cluster μ_i . Formula (1) is an objective function of the k-means method.

K-means algorithm:

1. K-points (centroids) are selected randomly from the initial set of points.
2. Using the formula (1), distribute the points in clusters relative to the centroid.
3. Find the new position of the centroids by calculating the center of each cluster.
4. Perform points 2 and 3 until the centroids stop changing their position or until a certain threshold of changing the position of the centroids.

Each iteration requires $N * k$ comparisons, determining the complexity of one iteration (Barsegyan et al.,2004).

4. Research Results

Historical and other scientific studies show that the development of the banking systems of Western and Eastern Europe was very different. In Western Europe, the

banking system is developed by market needs. With the development of trade relations, entrepreneurs felt a lack of funds, so asset owners helped resolve this problem. Creditors became bankers, and they opened offices where traders could borrow money.

Concerning countries of the post-Soviet space, which mainly form Eastern Europe, all the initiatives of voluntary borrowing ended in bankruptcy. Investors were robbed or couldn't obtain their investments back. This is the reason for another direction of development of financing in Eastern Europe, i.e., with the use of collateral, which became the property of investors if they lost their investments.

In the XIV-XV centuries, in Western Europe and some parts of Eastern Europe, the development of the banking system was directly proportional to trade. At the time, the governments of the countries felt these mutual connections and therefore initiated the creation of significant banks, which united small ones. Under these conditions, the state enshrined the importance of the central bank as the most important and often gave it the right to issue money. This allowed forming the banking rules to form the state's monetary and credit policy (Zobnin & Ling, 2015).

Let us consider the main differences in the origin of Eastern and Western European banking systems.

Table 1 –The main differences in the formation of the banking system between Western and Eastern European countries

Period	Western Europe and some Eastern European countries	Eastern European countries of the former CIS
	Prerequisites for the development of the banking system are the intensification of trade operations	Prerequisites for development are the protection of property rights of the nobility
Until the 1600s (Brokgauz & Efron, 1891)	Private banks have been set up in Italy at the initiative of entrepreneurs	The state created a set of state-owned banks
The middle of the XIX century	From a set of private banks the state selects the most influential one, and transferred functions of issue of banknotes to it	Public banks were established as a result of government decisions, which together with the state bank performed the function of issuing money
20-30 years of the twentieth century	Central banks were nationalized and reformed into state-owned ones	The state created a central bank

Source: Zobnin & Ling, 2015

Table 1 explains why the main feature of the formation of the banking system of many Eastern European countries is the young age of private commercial banks, about 25 years. If we consider the Central Bank of Russia to be the most influential of all the countries of Eastern Europe, it is only 160 years old (founded in 1861). In comparison, the banks that emerged several centuries ago operate in Europe. The oldest is the Banca Monte Dei Paschi di Siena in Italy, founded in 1472, the German bank Berenberg Bank, founded in 1590, the Bank of London C. Hoare & Co, founded in 1672, and others.

Regarding Eastern European countries compared to the West, their banking business developed faster, particularly in 1751 in the city of Brno (the Czech Republic, at that time, belonged to Austria) where the first private bank was founded state-level bank established in 1824. The main idea of creating this bank was to help people save money. The second half of the XIX century was an influential period of banking. When the Czech Republic was a part of Austria, 33 banking institutions were established (Vencovsky, 1999). The first Polish bank was established in 1828 based on the model of Western European banks (Morawski, 2008).

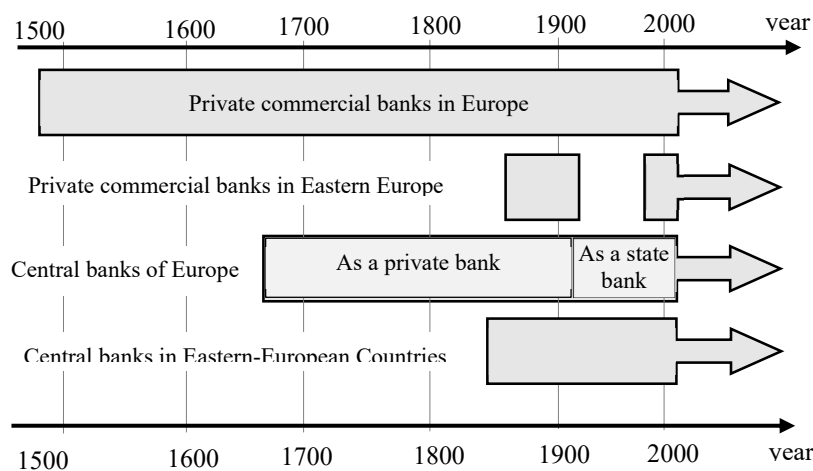


Figure 1. Stages of formation of the banking sector of Western and Eastern Europe
Source: Zobnin & Ling, 2015

However, in Russia, the rapid development of the banking sector began as soon as the state ceased to control it. In the early '90s, the banking system of the CIS countries was utterly unique, very different from the European ones. The number of banks, the level of privatization, the growth rate, and the emergence of freedom in banks were much higher than in Western Europe and the United States. The world economy did not know such rates of development. Suffice it to say that it took 80 years from 1781 to 1860 to create 1,000 banks in the United States. In Russia, for example, in 1995, ie seven years after the creation of the first bank, there were already 2,439 commercial banks. At about the same time, the government began to interfere in the regulation of banking actively. Banking scientists and specialists have developed legislation and carried out reforms to increase the growth of the banking sector. History shows that as soon as the state administrative and bureaucratic pressure disappears, commercial banks

multiply (Dmitriev & Travin, 1996). In particular, in 2021, there are 406 credit institutions in Russia. Banks and non-bank credit institutions in Russia provide financial services to customers based on a license issued by the Bank of Russia. There are two types of licenses for banks in Russia: universal, issued to banks with a capital of \$ 13 million, and basic - for banks with a capital of \$ 4 million. On the one hand, the basic license provides simplified regulation and, on the other, many restrictions. Two-thirds of banks in Russia have a universal license (they account for more than 95% of the sector's assets), and the rest basic.

At the beginning of 2021, there were 248 banks with a universal license, 118 banks with a basic license, and 40 non-bank credit institutions. (Khandruyev et al., 2021). Note that the number of banking organizations in Russia is declining every year. Thus, at the end of 2019, there were 484 credit organizations.

Table 2 – Number of Eastern European banks by country at the end of the year

Country	2015	2016	2017	2018	2019
Czech Republic	46	45	46	50	49
Poland	63	61	61	61	60
Bulgaria	27	26	26	25	25
Slovakia	13	12	13	12	12
Hungary	49	48	48	47	46
Russia	623	561	508	490	484
Romania	79	78	77	76	75
Moldova	10	10	10	10	10
Belarus	24	24	24	24	24
Ukraine	117	96	82	77	75

Source: Central Bank of the Russian Federation; Minfin; EBF; Narodowy Bank Polski; Infomarket; Statistical Reference Book 2020

According to Table 1, Ukraine and Moldova take second place in the number of banks, with about 75 banking institutions. Note that there is also a decrease in the number of banking institutions that do not withstand competition in these countries, so they close down. Slovakia, Moldova, and Belarus have the smallest number of banking institutions. Russia today has the largest number of large banks, which form the top 100

largest banks in Eastern Europe by assets (Table 3). However, the number of banking institutions does not always indicate the activity of the banking sector. Today we can say that most funds are concentrated in Russian banks. In the TOP-20 list of the largest banks in Eastern Europe by assets, there are 8 Russian banks, which form the top three in terms of assets.

Table 3 – TOP-20 largest banks in Eastern Europe by assets

Bank Name	Country	Assets on January 1, 2019 billion USD	Assets on January 1, 2020 billion USD	Absolute deviation, billion USD	Asset growth, %
SberBank	Russia	448,9	483,94	35,0	7,8
VTB Bank	Russia	212,4	250,64	38,2	18
Gazprombank	Russia	94,0	106,33	12,3	13,1
PKO Bank Polski	Poland	86,3	92,48	6,2	7,2
ČSOB	Czech Republic	61,3	72,1	10,8	17,6
OTP Bank	Hungary	51,9	68,27	16,4	31,5
Česká spořitelna	Czech Republic	63,5	64,48	1,0	1,6
Альфа-Банк	Russia	47,8	60,57	12,8	26,7
Santander Bank Polska	Poland	54,9	55,66	0,7	1,3
Bank Pekao	Poland	50,8	54,02	3,2	6,3
FK Otkrytie	Russia	31,6	52,72	21,1	66,6
Roselhozbank	Russia	44,8	51,95	7,1	15,9
Komerční banka	Czech Republic	47,2	47,63	0,4	0,9
mBank	Poland	38,8	42,17	3,4	8,8
ING Bank Śląski	Poland	37,7	42,14	4,4	11,7
Moscow Kredit Bank	Russia	30,9	39,15	8,3	26,7
PromSvjazBank	Russia	18,4	34,93	16,5	89,4
UniCredit Bank Czech Republic and Slovakia	Czech Republic	29,9	30,35	0,4	1,5
BGŻ BNP Paribas	Poland	29,0	29,22	0,2	0,8
Bank Gospodarstwa Krajowego	Poland	22,5	26,71	4,2	18,5

Source: RiaRating, 2020

It should be noted that the largest bank of all Eastern European countries is Sberbank. Its assets amount \$483

billion. VTB Bank of Russia and Gazprombank follow it. Poland's largest bank is PKO Bank Polski, with \$ 92

billion in assets. Assessing the activity of the banking sector, it is safe to say that Russia today has the largest number of banks with the largest total assets. At the beginning of 2020, the assets of Russian banks amounted to \$ 13.54 billion. In second place after Russia with values less than twice that of Poland, its total assets of banks at the beginning of 2020 is \$ 718.2 million. The

Czech Republic takes third place. The assets of Czech banks at the beginning of 2020 amounted to \$ 366466 million. All other countries have approximately the same level of banking activity. Moldova has the smallest number of banking institutions among the countries under review (Fig. 2).

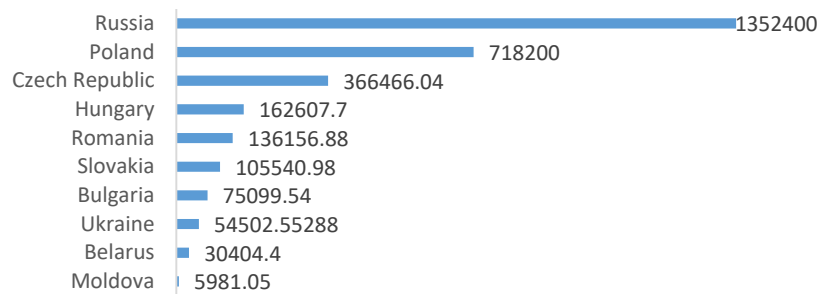


Figure 2. Comparison of banking assets by Eastern European countries, USD million

The ratio of bank assets to GDP in Russia is about 90%. More than half of the assets of credit institutions are loans, of which 2/3 - corporate and 1/3 - loans to households. Liabilities are dominated by funds of customers, companies, and individuals. It should be noted that most banking institutions in the EU have a significant share of foreign investment in capital (over 50%). At that time, in the CIS countries, in particular Ukraine, at the beginning of 2020, 29.8% of banks' assets belonged to foreign

companies (National Bank of Ukraine, 2020). In Belarus, the value is 19.7% (National Bank of the Republic of Belarus, 2020), in Poland 56% (Narodowy Bank Polski, 2019). However, in Russia at the beginning of 2020, the value is 11.79% (Central bank of the Russian Federation, 2019). One of the most critical indicators that determine the efficiency of the banking sector is the ratio of banks' assets to gross domestic product (Table 4).

Table 4 – The ratio of bank assets to GDP in Eastern Europe at the end of 2019

Country	Bank Assets, \$mln	GDP, \$mln	% Bank Assets / GDP
Czech Republic	366466	250700	146
Poland	718200	595900	121
Bulgaria	75100	68560	110
Slovakia	105541	105100	100
Hungary	162608	163500	99
Russia	1352400	1501507	90
Romania	136157	250100	54
Moldova	5195	11970	43
Belarus	30404	63080	48
Ukraine	54503	153800	35
Average	300736	316422	85

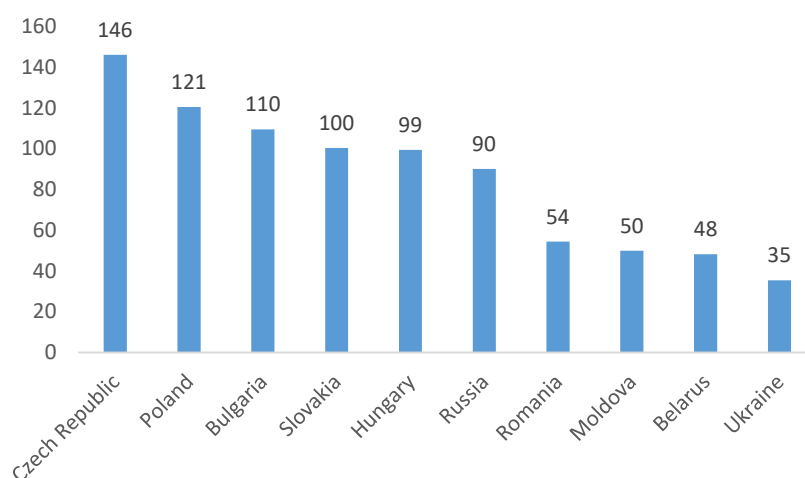


Figure 3. Comparison of the ratio of bank assets to GDP in Eastern Europe, %

Despite Russia's prime position in terms of assets, the ratio of the bank's assets to GDP is far from the European average of 488%. In particular, in Russia, this figure is about 90%. At the same time, this figure is much lower than the Czech Republic, which at the end of 2019 was 146%, as well it is lower in Poland, Bulgaria, and Slovakia. The ratio of bank assets to GDP shows the relationship between the economy's financial and real sectors. The higher the rate, the more popular the loans are for businesses, and the more people trust their funds with banking institutions.

The main trends in the development of the banking sector in Eastern Europe in the period from 2015 to 2019 include:

- strengthening the universalization of banks;

- significant growth in the number of credit institutions, including with the participation of foreign capital;
- reorganization of the branch network of credit organizations;
- increase in the number of internal structural subdivisions of credit organizations and their branches;
- expanding the range of banking products and services;
- mass revocation of licenses in commercial banks.

The events of recent developments in Eastern Europe's economies have shown the dependence of the development of the financial and real sectors.

Let us consider other indicators of the banking sector in Eastern Europe. They include the number of loans issued, deposits received, the cost of equity, and these indicators' ratio to assets.

Table 5 – The main indicators of the banking sector in Eastern Europe at the end of 2019

Country	Assets, \$mln	Loans, \$mln	Loans/Assets, %	Deposit, \$mln	Deposits/Assets, %	Capital, \$mln	Capital/Assets, %
Czech Republic	366466,0	181129	49,4	146610,3	40,0	25332,7	6,9
Poland	718200,0	277916	38,7	281611,6	39,2	58368,7	8,1
Bulgaria	75099,5	33016	44,0	4531,1	6,0	7709,8	10,3
Slovakia	105541,0	53807	51,0	52399,0	49,6	8756,5	8,3
Hungary	162607,7	59250	36,4	71805,6	44,2	11850,8	7,3
Russia	1352400,0	719978	53,2	821730,0	60,8	151466,0	11,2
Romania	136156,9	55923	41,1	13163,1	9,7	13163,1	9,7
Moldova	5195,0	2322	44,7	940,8	18,1	940,8	18,1
Belarus	30404,4	20825	68,5	19839,8	65,3	4510,1	14,8
Ukraine	54502,6	37693	69,2	4957,1	9,1	7325,1	13,4
Average	x	x	49,6	x	34,2	x	10,8

It can be concluded that absolute values do not always indicate the efficiency of the banking sector. It is possible to make a classification of countries by assets. Still, in our opinion, it is more appropriate to classify countries by the

system of indicators that are calculated in Table 6. These include Assets / GDP, Loans / Assets, Capital / Assets and Deposits / Assets.

Let us consider a cluster analysis of the banking results of Eastern European countries. The initial data are written in Table 6, as shown below.

Table 6 – Initial data of cluster analysis using the algorithm K-means

	A	B	C	D	E	F	G	H	I	G
Assets/GDP,%	99,5	120,5	54,4	109,5	50,0	146,2	100,4	90,1	48,2	35,4
Loans/Assets, %	69,2	68,5	53,2	51,0	49,4	44,7	44,0	41,1	38,7	36,4
Capital/Assets, %	14,83	13,44	10,27	9,67	6,91	18,11	11,20	8,30	7,29	8,13
Deposits/Assets, %	44,2	39,2	9,7	6,0	18,1	40,0	49,6	60,8	65,3	9,1

Note: Hungary (A), Poland (B), Romania (C), Bulgaria (D), Moldova (E), Czech Republic (F), Slovakia (G), Russia (H), Belarus (I), Ukraine (J)

We will conduct a cluster analysis of the obtained data to compare countries and identify the main groups that they form. We use the method of K-means for this. To begin with, let's compare the distances from the indicators of country E (Moldova) to the reference points.

$$d(Ee1) = \sqrt{(50 - 99.5)^2 + (49.4 - 69.2)^2 + (6.91 - 14.83)^2 + (18.1 - 44.2)^2} = 59.885$$

$$d(Ee2) = \sqrt{(50 - 120.5)^2 + (49.4 - 68.5)^2 + (6.91 - 13.44)^2 + (18.1 - 39.2)^2} = 76.308$$

$$d(Ee3) = \sqrt{(50 - 54.4)^2 + (49.4 - 53.2)^2 + (6.91 - 10.27)^2 + (18.1 - 9.7)^2} = 10.754$$

$$d(Ee4) = \sqrt{(50 - 109.5)^2 + (49.4 - 51)^2 + (6.91 - 9.67)^2 + (18.1 - 6)^2} = 60.802$$

The distance d (Ee3) is minimal.

List the values to the reference point e3:

$$(50.0+54.4)/2 = 52.2;$$

$$(49.4+53.2)/2 = 51.3;$$

$$(6.91+10.27)/2 = 8.59;$$

$$(18.1+9.7)/2 = 13.9;$$

Distance from the country's indicator F(Czech Republic) to the reference points.

$$d(Fe1) = 53.005$$

$$d(Fe2) = 35.347 - \text{min}$$

$$d(Fe3) = 98.242$$

$$d(Fe4) = 51.125$$

Distance from the country's indicator G (Slovakia)) to the reference points.

$$d(Ge1) = 26.042 - \text{min}$$

$$d(Ge2) = 36.951$$

$$d(Ge3) = 60.48$$

$$d(Ge4) = 45.112$$

Distance from the country's indicator H (Russia)) to the reference points.

$$d(He1) = 23.51 - \text{min}$$

$$d(He2) = 51.148$$

$$d(He3) = 61.157$$

$$d(He4) = 58.985$$

Distance from the country's indicator I (Belarus)) to the reference points.

$$d(Ie1) = 49.377 - \text{min}$$

$$d(Ie2) = 91.123$$

$$d(Ie3) = 53.089$$

$$d(Ie4) = 86.204$$

Distance from the country's indicator J (Ukraine)) to the reference points.

$$d(Je1) = 62.563$$

$$d(Je2) = 104.838$$

$$d(Je3) = 22.967 - \text{min}$$

$$d(Je4) = 75.604$$

Recalculation of the value for the reference point e2

$$(146.2+120.5)/2 = 133.35;$$

$$(44.7+68.5)/2 = 56.6;$$

$$(18.11+13.44)/2 = 15.775;$$

$$(40.0+39.2)/2 = 39.6.$$

Recalculation of the value for the reference point e1

$$(100.4+99.5)/2 = 99.95;$$

$$(44.0+69.2)/2 = 56.6;$$

$$(11.20+14.83)/2 = 13.015;$$

$$(49.6+44.2)/2 = 46.9$$

Recalculation of the value for the reference point e1

$$(90.1+99.95)/2 = 95.025;$$

$$(41.1+56.6)/2 = 48.85;$$

$$(8.30+13.015)/2 = 10.6575;$$

$$(60.8+46.9)/2 = 53.85;$$

Recalculation of the value for the reference point e1

$$(48.2+95.025)/2 = 71.6125;$$

$$(38.7+48.85)/2 = 43.775;$$

$$(7.29+10.6575)/2 = 8.97375;$$

$$(65.3+53.85)/2 = 59.575;$$

Recalculation of the value for the reference point e3:

$$(35.4+52.2)/2 = 43.8;$$

$$(36.4+51.3)/2 = 43.85;$$

$$(8.13+8.59)/2 = 8.36;$$

$$(9.1+13.9)/2 = 11.5;$$

Let's classify objects.

$$d(Ae1) = \sqrt{(99,5 - 71,613)^2 + (69,2 - 43,775)^2 + (14,83 - 8,874)^2 + (44,2 - 59,575)^2} = 41,168$$

$$d(Ae2) = \sqrt{(99,5 - 133,35)^2 + (69,2 - 56,6)^2 + (14,83 - 15,775)^2 + (44,2 - 39,6)^2} = 36,423$$

$$d(Ae3) = \sqrt{(99,5 - 43,8)^2 + (69,2 - 43,85)^2 + (14,83 - 8,36)^2 + (44,2 - 11,5)^2} = 69,687$$

$$d(Ae4) = \sqrt{(99,5 - 109,5)^2 + (69,2 - 51)^2 + (14,83 - 9,67)^2 + (44,2 - 6)^2} = 43,785$$

Thus, object A (Hungary) is closest to point E2. The results for other countries are systematized in the table.

Table 7 – Determining the closest location of objects to the main points

	A	B	C	D	E	F	G	H	I	G
E1	41.168	58.621	53.612	66.018	47.151	77.658	30.549	18.732	24.688	62.563
E2	36.423	17.673	84.67	42.029	86.833	17.673	36.951	51.148	91.123	104.838
E3	69.687	85.344	14.376	66.329	10.719	106.742	68.288	67.689	54.235	11.484
E4	43.785	39.29	55.271	0	60.802	51.125	45.112	58.985	86.204	75.604

According to the results of the analysis, we have formed 4 clusters that allow us to classify the types of Eastern European countries.

Table 8 – Results of cluster analysis of the main indicators of the banking sector of Eastern European countries

e ₁	e ₂	e ₃	e ₄
G,H,I Slovakia Russia Belarus	A,B,F Hungary Poland Czech Republic	C,E,J Romania Moldova Ukraine	D Bulgaria

The first group is formed by Slovakia, Russia, and Belarus, which have the most similar indicators of the structure of assets and liabilities and the importance of the financial sector in real terms. The second group is formed by the EU countries: Poland, the Czech Republic, and associated Hungary. The third sector is formed by the EU-associated countries Romania, Moldova, and Ukraine. Bulgaria has the fourth sector with the most dissimilar banking system to other countries.

5. Discussions

W. Bejot was the first to draw attention to the connection between economic growth and the banking sector. In 1873, he published many examples of how the financial sector could promote economic development, expanded reproduction in lucrative industries. Schumpeter and Cameron later developed this theme. Today's researchers show that the modern banking sector must effectively and cheaply translate savings into investments, weed out unpromising business projects and diversify

risks. However, this requires single public confidence in the banking sector, which shows the ability to save and invest in the economy. Many studies (Demirguc-Kunt, 2006; Beom et al., 2006; Aghion, 2005) have determined that the optimal loan-to-GDP ratio should be 80-100%, while the banking systems of these countries have not reached the recommended level. However, the Czech Republic (72%), Slovakia (51%), Bulgaria (48%), and Poland (46%) are the closest. In Britain, the figure is 700%, the United States - 500%, Germany - 600% concerning other European countries. However, many studies show that it is important to increase the volume of financial services and distribute it between different segments of the financial system.

The level of high technology used in the country is essential in developing the financial sector (Gospodarik, 2020). There is a crisis of traditional business models for the banking sectors of many Eastern European countries. With the development of mobile and digital content, the standards of banking services no longer meet the demands of most customers. Gradually, the lines of banking products will decline and gradually be phased out. Their place was taken by components in applications. Soon, they will be replaced by "embedded" finance, which will be able to integrate payments, debit cards, loans, insurance, and investment instruments in almost any non-financial products. Under the influence of growing digitalization, the horizon of the banking system is beginning to change more and more noticeably.

The trend of banks' strategies is the mass customization of services based on the analysis of big data (Big Data) and artificial intelligence. Indirect evidence that historically establish business models are exhausting and can be an addition to the number of cases of voluntary issuance of banking licenses (Khandruyev et al., 2021),

which is noticeable in the analysis of each country, more in the CIS and less in countries currently in the EU.

6. Conclusions

Thus, we can conclude that Eastern European countries' banking sector differs from the banking sector of developed and Western European countries by its low participation in economic processes. This is due to historical preconditions, as the former USSR countries have formed a banking system based on state regulation. In contrast, developed countries build a banking system based on investment, that is, in accordance with market needs. This explains why the banks of Eastern European countries mainly provide money circulation but do not stimulate the economy. However, depending on the historical background of each country, the importance of the banking sector in the economy is different. In particular, the banks of Poland, the Czech Republic, Slovakia, and Bulgaria support the economy more. In these countries, there are no rapid negative dynamics in the number of banks. Their banking system is characterized by the use of modern technologies and foreign investment. At the same time, the countries of the former CIS, which are also part of Eastern Europe, lack an innovative approach to the management and regulation of the banking sector.

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