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Diagnosics of Transparency of Ukrainian Banking Institutions Using Multivariate Analysis Methods

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Abstract. Due to the imperfect state of transformations in the financial system of Ukraine and the banking sector, there is a steady tendency to increase the number of financially insolvent enterprises in various industries. This is especially true for the banking market, where considerable qualitative and quantitative changes have occurred recently. The purpose of this study is to investigate the problem of managing the of banking institutions by diagnosing the transparency level of their activities. The research methodology lies in forming a system of indicators to estimate the transparency level of business entities' activities, assessing the level of direct impact on the level of transparency, and classifying business entities according to a two-level system of factors influencing transparency. The final stage of the methodology is the positioning of banks according to transparency level to formulate vectors for improving transparency management policies. The combination of multidimensional analysis methods, namely applied econometric methods, cluster and variance analysis, allows classifying business entities according to the transparency level, considering differentiation. The result of the differentiation is a matrix of positioning the transparency level of banking institutions according to a two-level system of factors. The proposed scientific and methodological approach to calculating the transparency level of a business entity, namely banking institutions, which, apart from the financial block, includes other criteria, enables a much broader study of the state of activity of the business entity. The use of this scientific and methodological approach helps reduce the level of information asymmetry, increase the flexibility of the business entity's response to external shocks, which increases confidence in business entities, improves their business reputation and is certainly reflected in financial indicators. Positive improvements in the financial performance of individual business entities, increasing the flexibility and trust in them, will help increase the transparency of financial flows that move in the country

Keywords: asymmetry, bank, transparency, business entity, financial flowst



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INTRODUCTION

One of the features of the transformational processes in the country's financial system, and therefore their consequences, is the asymmetry of information and insufficient transparency of the functioning of business entities. In the context of rapid institutional changes, it is important to increase the transparency of the activities of business entities, as well as to fully cover the essential information about their activities, financial condition, and development prospects.

Non-disclosure or improper disclosure of essential information leads to an increase in information asymmetry and can adversely affect not only the financial security of individual business entities, but also the financial system of the entire country. The lack of an effective information disclosure system, which is one of the main elements of building trust in an enterprise, also affects its investment attractiveness and financial stability.

The problem of information asymmetry is one of the most universal in the economy. Information asymmetry hinders the adoption of optimal business decisions, increases transaction costs for producers, and reduces the level of trust in enterprises for customers, partners, counterparties, and investors. The problem of information asymmetry is particularly important in developing countries, as they do not have an effective institutional environment, which leads to the shadowing of business activities (Shkodina & Onishchenko, 2018; Lin, 2016; Zaboranna, 2020).

Analysis of current research and publications (Busko, 2016; Kovalenko, 2019; Nekhili, 2020) has shown that the problem of information asymmetry in Ukraine is becoming critical as the importance of information increases. The economic development of Ukraine demonstrates the formation of a special sector based on the production, distribution, exchange, and use of an important resource – information. However, the dynamism of Ukraine's information economy is considerably limited by the underdevelopment of democratic institutions, the absence of legislation, the imperfect sectoral structure of Ukraine's economic complex, the degradation of the education and science system in Ukraine, the presence of administrative barriers, and the low financial situation of the vast majority of the population (Azarenkova *et al.*, 2018; Makarenko *et al.*, 2018; Bukhtiarova *et al.*, 2019; Barna & Ruschyshyn, 2020).

Despite the existing problems, the development of the information economy in Ukraine is still taking place. This is facilitated by the influence of globalization, open information spheres, the use of practices of other countries, and the integration of the state into the world information space. Thus, with the development of the information economy, the level of information asymmetry increases (Shkodina & Onishchenko, 2016; Levchenko & Ostapenko, 2016).

According to the authors, the core motives of this situation include the insufficient transparency level that

has developed in the Ukrainian banking sector. This negatively impacts the economic development of the state. Firstly, this reduces the investment attractiveness of enterprises, branches of the national economy, and their competitiveness. This prevents investors from feeling confident in the stability of the "rules of the game", reduces their inflation expectations and suspends economic growth. Thus, effective management of banking transparency becomes a prerequisite for all actors operating in the banking market to be able to make effective financial decisions. It also provides opportunities for analysing, planning and predicting the sustainable socio-economic recovery of the state (Makarenko *et al.*, 2020; Bukhtiarova *et al.*, 2020; Shkolnyk *et al.*, 2019). Therefore, optimal transparency management in the banking sector is an important issue today. This allows developing the banking system at the appropriate, stable level and make effective management decisions by all subjects of the Ukrainian economy. An integral part of reducing the asymmetry of information about the activities of banking institutions in the country is an objective and correct assessment of the transparency of their activities (Onishchenko, 2020).

The purpose of this study is the implementation of diagnostics of the transparency level in the activities of banking institutions of Ukraine based on multidimensional modelling and applied econometric methods, to increase the efficiency of management decision-making. The study of the problem of transparency of banking institutions allows identifying the following tasks:

- analysis and synthesis of indicators reflecting the transparency level of activities;
- assessment of factors of influence and identification of banks according to the level of influence of factors on transparency;
- formation of homogeneous classes of banking institutions in terms of transparency;
- assessment of differences between classes, considering the separate influence of different groups of factors;
- positioning according to a two-level system of factors;
- implementation of research results for the development of appropriate management decisions (Ponomarenko *et al.*, 2013; Kuznetsova, 2014; Sergienko *et al.*, 2018).

MATERIALS AND METHODS

To fulfil the purpose and complete the tasks of this study, the latter was based on data on leading banking institutions in Ukraine, which are presented in Tables 1-2. Table 1 shows the results of assessing the transparency level of leading banking institutions in Ukraine based on an analysis of their official websites on the Internet (Onishchenko, 2020). Table 2 contains the transparency level of the activities of each of the banking institutions in Ukraine under study and their key performance indicators (deposits, equity, assets, net profit).

Table 1. Results of the study of transparency of banking institutions of Ukraine based on the scientific and methodological approach to calculating the level of transparency of a business entity's activities using a system of criteria

No.	Bank	X1 General information about the business entity Max value =12%	X2 Legal documents regulating the business entity's activities Max value =13.5%	X3 Investment activity of the business entity Max value =7%	X4 Marketing policy of the business entity Max value =18.5%	X5 General information about the personnel support of a business entity Max value =6.5%	X6 Information on maintaining environmental friendliness and safety of the business entity's activities Max value =2%	X7 Cooperation with other business entities Max value =5%	X8 Financial statements of the business entity Max value =22%	X9 Results of business entity inspections Max value =4%	X10 Risk management of the business entity Max value =1.5%	X11 Rating of the business entity Max value =2%	X12 Overall performance of the business entity Max value =3%	X13 Cooperation of the business entity with the media Max value =2%	X14 Tax documents of the business entity Max value =1%	Y TRANSPARENCY OF THE BUSINESS ENTITY (sum of x1-x14) Max value =100%
1	Raiffeisen Bank Aval JSC	6.50%	12.50%	0%	15.50%	2%	0%	5.00%	22.00%	4.00%	1.50%	2.00%	3.00%	2.00%	75.50%	
2	Ukrsibbank JSC	9.50%	12.50%	0%	15.50%	2%	0%	0.00%	22.00%	0.00%	0.00%	2.00%	3.00%	2.00%	68.00%	
3	Citibank JSC	9.00%	7.50%	2%	18.50%	2%	0%	0.00%	22.00%	0.00%	0.00%	2.00%	3.00%	2.00%	67.50%	
4	ING Bank Ukraine JSC	9.00%	12.50%	0%	15.50%	0%	0%	0.00%	22.00%	0.00%	0.00%	0.00%	0.00%	2.00%	61.00%	
5	Crédit Agricole Bank JSC	9.50%	12.50%	0%	11.50%	3%	0%	5.00%	22.00%	0.00%	0.00%	2.00%	3.00%	2.00%	70.50 %	
6	OTP Bank JSC	6.50%	11.00%	0%	11.50%	2%	0%	5.00%	22.00%	4.00%	1.50%	0.00%	3.00%	2.00%	68.00%	
7	Commercial Bank "PrivatBank" JSC	9.50%	12.50%	0%	11.50%	2%	0%	5.00%	22.00%	4.00%	1.50%	2.00%	3.00%	2.00%	74.50%	
8	Ukreximbank JSC	6.50%	6.00%	0%	11.50%	2%	0%	5.00%	22.00%	0.00%	0.00%	2.00%	0.00%	2.00%	56.50 %	
9	Oschadbank JSC	9.00%	11.00%	0%	11.50%	2%	0%	5.00%	22.00%	0.00%	0.00%	2.00%	0.00%	2.00%	64.00%	
10	ProCredit Bank JSC	9.50%	11.00%	0%	11.50%	3%	1%	5.00%	22.00%	4.00%	1.50%	2.00%	3.00%	2.00%	75.50%	
11	Pravex Bank JSC	9.00%	12.50%	0%	15.50%	2%	0%	0.00%	22.00%	4.00%	1.50%	2.00%	0.00%	2.00%	70.00%	
12	Idea Bank JSC	9.50%	11.00%	0%	12.50%	2%	0%	5.00%	22.00%	0.00%	1.50%	2.00%	0.00%	2.00%	67.00%	
13	Piraeus Bank JSC	6.50%	11.00%	0%	8.50%	3%	0%	5.00%	22.00%	4.00%	0.00%	0.00%	3.00%	2.00%	65.00%	
14	Alfa-Bank JSC	9.50%	6.00%	0%	11.50%	2%	0%	0.00%	22.00%	0.00%	1.50%	0.00%	0.00%	2.00%	54.00%	
15	FUIB (PUMB) JSC	11.50%	6.00%	0%	11.50%	2%	0%	2.50%	22.00%	4.00%	1.50%	2.00%	0.00%	2.00%	64.50%	
16	JSB UKRGASBANK PJSC	9.50%	11.00%	0%	15.50%	4%	0%	5.00%	22.00%	4.00%	1.50%	2.00%	3.00%	2.00%	79.50%	
17	SEB Corporate Bank JSC	9.50%	11.00%	0%	8.50%	2%	0%	0.00%	22.00%	0.00%	0.00%	0.00%	0.00%	2.00%	54.50%	
18	Credit Europe Bank JSC	9.50%	5.00%	0%	8.50%	2%	0%	0.00%	22.00%	4.00%	0.00%	0.00%	0.00%	2.00%	52.50%	
19	JSCB "Lviv" JSC	11.50%	0.00%	0%	12.50%	3%	0%	0.00%	22.00%	4.00%	1.50%	2.00%	0.00%	2.00%	58.50%	
20	Kredobank JSC	6.50%	6.00%	0%	8.50%	2%	0%	0.00%	22.00%	4.00%	0.00%	0.00%	0.00%	2.00%	50.50%	

Source: based on the authors' calculations

Table 2. Key performance indicators of the banking institutions of Ukraine understudy, proposed as factors of direct influence on the transparency of their activities

No.	Bank	Transparency, % (Y)	Deposits, billion UAH (F1)	Equity, billion UAH (F2)	Assets, billion UAH (F3)	Net profit, billion UAH (F4)
1	Raiffeisen Bank Aval JSC	75.50%	61	11.3	77.6	3.2
2	Ukrsibbank JSC	68.00%	41.1	6.2	51.5	2
3	Citibank JSC	67.50%	23.4	2.4	26.5	1.4
4	ING Bank Ukraine JSC	61.00%	6.7	4	10.9	0.5
5	Crédit Agricole Bank JSC	70.50 %	30.3	4.6	37.3	1.2
6	OTP Bank JSC	68.00%	30.5	7	39.3	1.7
7	Commercial Bank "PrivatBank" JSC	74.50%	219.1	45.5	288.9	25.8
8	Ukreximbank JSC	56.50 %	75	8.9	141.6	1.6
9	Oschadbank JSC	64.00%	167.6	18.7	218.1	0.2
10	ProCredit Bank JSC	75.50%	12.8	3.4	21.9	0.5
11	Pravex Bank JSC	70.00%	2.8	2	4.9	-0.04
12	Idea Bank JSC	67.00%	4	0.8	5.1	0.2
13	Piraeus Bank JSC	65.00%	1.8	0.6	2.8	0.03
14	Alfa-Bank JSC	54.00%	54.8	6.3	64.3	1.3
15	FUIB (PUMB) JSC	64.50%	41.2	8.2	52.2	1.8
16	JSB UKRGASBANK PJSC	79.50%	94	6.3	110.1	0.3
17	SEB Corporate Bank JSC	54.50%	1	0.6	1.8	0.05
18	Credit Europe Bank JSC	52.50%	0.4	0.4	1	0.05
19	JSCB "Lviv" JSC	58.50%	1.9	0.3	2.9	0.01
20	Kredobank JSC	50.50%	13	2.3	17.4	0.3

Source: compiled by the authors based on (Litvinchuk, 2019)

The selection of the main groups of criteria was based on the significance of particular transparency-related information about an entity for its users. Each of the 14 categories of evaluated components of transparency in the activities of a business entity comprises separate groups of factors, the description and calculation method of which are presented in Table 3 (Shkodina & Onishchenko, 2018). Each criterion, according to the table above, is assigned a certain proportion, depending on its significance. The maximum values between the 14 components of transparency

and their subcomponents in the table were distributed according to the significance of the factor groups of each of the 14 categories, according to the authors. The sum of all criteria is equal to 100%, i.e., to find the transparency level, it is necessary to figure out the percentage of the criteria factually presented on the official website of the business entity. If the official website of a business entity contains information defined by a certain criterion, this criterion is used to assign the corresponding weight percentage defined in Tables 3-4.

Table 3. Results of assessing the transparency level of the 1st experimental group of Ukrainian banks using a scientific and methodological approach (detailed assessment according to the selected criteria)

No.	Criteria group	Composition of criteria	Criterion weight in %	Raiffeisen Bank Aval	Ukrsibbank	Citibank	ING Bank Ukraine	Crédit Agricole Bank	OTP Bank	PrivatBank	Ukreximbank	Oschadbank	ProCredit Bank	
1	General information about BE	History of BE creation	0.50%	0.50%	0.50%	0%	0%	0.50%	0.50%	0.50%	0.50%	0%	0.50%	
		Organizational structure and information about BE owners	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
		BE goals and strategy	3.00%	0.00%	3.00%	3.00%	3.00%	3.00%	3.00%	0%	3.00%	0%	3.00%	3.00%
		Reviews about the activities of BE	2.50%	0.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		BE contacts and address	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
2	Legal documents regulating the activities of BE	BE charter	5.00%	5.00%	5.00%	0%	5.00%	5.00%	5.00%	5.00%	0%	5.00%	5.00%	
		Licences and certificates for the implementation of BE's activities	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
		Collective agreement	1.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
3	Investment activity of the BE	Laws, regulations, orders, and other regulatory acts based on which the BE carries out its activities	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	0%	1.50%	0%	0%	0%	
		General information about current BE investment projects	3.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	BE's marketing policy	Strategic vectors of the BE's investment policy	2.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Information on the results of BE's investment activities	2.00%	0%	0%	2.00%	0%	0%	0%	0%	0%	0%	0%	0%
		Characteristics of BE's products, works, and services	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
		Quality guarantees of BE's products, works, and services (certificates, diplomas, patents, and licences)	4.00%	4.00%	4.00%	4.00%	4.00%	0%	0%	0%	0%	0%	0%	0%
		BE's social policy	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
5	General information about the BE's personnel support	Characteristics of innovation of BE's products, works, and services	3.00%	0%	0%	3.00%	0%	0%	0%	0%	0%	0%	0%	0%
		BE's pricing policy	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
		Quantitative composition	1.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Current vacancies	1.50%	1.50%	1.50%	1.50%	0%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
		Conditions and principles of competitive selection to fill vacant positions in the BE	1.50%	0%	0%	0%	0%	0%	1.50%	0%	0%	0%	0%	1.50%
6	Information on maintaining environmental friendliness and safety of BE's activities	Staffing table	2.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
		Activities of the trade union organisation	0.50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7	Cooperation with other BEs	Standards and regulations governing labour safety of BE's	1.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
		Documents confirming the environmental friendliness of the BE's activities	1.00%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1.00%
8	BE's financial statements	Domestic partners of the BE and joint projects	2.50%	2.50%	0%	0%	0%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	
		BE's foreign partners and joint projects	2.50%	2.50%	0%	0%	0%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	
		Balance	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
		Statement of financial results	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
9	Results of BE inspections	Statement of equity	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	
		Cash flow statement	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	
10	BE risk management	Reports on the results of external inspections (audits) of the BE	4.00%	4.00%	0%	0%	0%	0%	4.00%	4.00%	0%	0%	4.00%	
		Information on possible risks and their consequences of BE's activities	1.50%	1.50%	0%	0%	0%	0%	1.50%	1.50%	0%	0%	1.50%	
11	BE's place in the ratings	Domestic and international ratings	2.00%	2.00%	2.00%	2.00%	0.00%	2.00%	0%	2.00%	2.00%	2.00%	2.00%	
12	Overall results of the BE's activities	Report on the overall results of the BE's activities	3.00%	3.00%	3.00%	3.00%	0.00%	3.00%	3.00%	3.00%	0%	0%	3.00%	
13	BE's cooperation with the media	Press, television, radio, social networks	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
14	BE's tax documents	Availability of reports on the results of BE taxation	1.00%	0%	0%	0%	0%	0%	0	0%	0%	0%	0%	
Amount			100.00%	75.50%	68.00%	67.50%	61.00%	70.50%	68.00%	74.50%	56.50%	64.00%	75.50%	

Source: compiled by the authors based on (Litvinchuk, 2019)

Table 4. Results of assessing the transparency level of the 2nd experimental group of Ukrainian banks using a scientific and methodological approach (detailed assessment according to the selected criteria)

No.	Criteria group	Composition of criteria	Criterion weight in %	Pravex Bank	Idea Bank	Piraeus Bank	Alfa-Bank	FUIB (PUMB)	UKRGASBANK	SEB Corporate Bank	Credit Europe Bank	Bank Lviv	Kredobank	
1	General information about BE	History of BE creation	0.50%	0.00%	0.50%	0.50%	0.50%	0.00%	0.50%	0.50%	0.50%	0.00%	0.50%	
		Organizational structure and information about BE owners	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
		BE goals and strategy	3.00%	3.00%	3.00%	0.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
		Reviews about the activities of BE	2.50%	0.00%	0.00%	0.00%	0.00%	2.50%	0.00%	0.00%	0.00%	2.50%	0.00%	
2	Legal documents regulating the activities of BE	BE contacts and address	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
		BE charter	5.00%	5.00%	5.00%	0.00%	0.00%	0.00%	5.00%	5.00%	5.00%	0.00%	0.00%	
		Licences and certificates for the implementation of BE's activities	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	0.00%	0.00%	6.00%
		Collective agreement	1.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3	Investment activity of the BE	Laws, regulations, orders, and other regulatory acts based on which the BE carries out its activities	1.50%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
		General information about current BE investment projects	3.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Strategic vectors of the BE's investment policy	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
4	BE's marketing policy	Information on the results of BE's investment activities	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
		Characteristics of BE's products, works, and services	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
		Quality guarantees of BE's products, works, and services (certificates, diplomas, patents, and licences)	4.00%	4.00%	4.00%	0.00%	0.00%	0.00%	4.00%	0.00%	0.00%	4.00%	0.00%	
		BE's social policy	3.00%	3.00%	0.00%	0.00%	3.00%	3.00%	3.00%	0.00%	0.00%	0.00%	0.00%	
		Characteristics of innovation of BE's products, works, and services	3.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	General information about the BE's personnel support	BE's pricing policy	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	
		Quantitative composition	1.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.00%	0.00%	0.00%	0.00%	0.00%	
		Current vacancies	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	
		Conditions and principles of competitive selection to fill vacant positions in the BE	1.50%	0.00%	0.00%	1.50%	0.00%	0.00%	1.50%	0.00%	0.00%	1.50%	0.00%	
6	Information on maintaining environmental friendliness and safety of BE's activities	Staffing table	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
		Activities of the trade union organisation	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
7	Cooperation with other BEs	Standards and regulations governing labour safety of BE's	1.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
		Documents confirming the environmental friendliness of the BE's activities	1.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
8	BE's financial statements	Domestic partners of the BE and joint projects	2.50%	0.00%	2.50%	2.50%	0.00%	2.50%	2.50%	0.00%	0.00%	0.00%	0.00%	
		BE's foreign partners and joint projects	2.50%	0.00%	2.50%	2.50%	0.00%	0.00%	2.50%	0.00%	0.00%	0.00%	0.00%	
		Balance	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	
		Statement of financial results	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	
9	Results of BE inspections	Statement of equity	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	
		Cash flow statement	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	
10	BE risk management	Reports on the results of external inspections (audits) of the BE	4.00%	4.00%	0.00%	4.00%	0.00%	4.00%	4.00%	0.00%	4.00%	4.00%	4.00%	
11	BE's place in the ratings	Information on possible risks and their consequences of BE's activities	1.50%	1.50%	1.50%	0.00%	1.50%	1.50%	1.50%	0.00%	0.00%	1.50%	0.00%	
12	Overall results of the BE's activities	Domestic and international ratings	2.00%	2.00%	2.00%	0.00%	0.00%	2.00%	2.00%	0.00%	0.00%	2.00%	0.00%	
13	BE's cooperation with the media	Report on the overall results of the BE's activities	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%	3.00%	0.00%	0.00%	0.00%	0.00%	
14	BE's tax documents	Press, television, radio, social networks	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
Amount			100.00%	70.00%	67.00%	65.00%	54.00%	64.50%	79.50%	54.50%	52.50%	58.50%	50.50%	

Source: built based on (Shkodina & Onishchenko, 2018)

The effectiveness of disclosure of this information is ensured by the availability of measures to increase the availability of information for all concerned market participants and ease of interpretation. The scientific and methodological approach is aimed at investigating the transparency of the activities of business entities, since

the overall transparency of the financial system in the country depends on the transparency of the activities of business entities. The transparency level of the banking institutions under study is estimated using a four-step scale for assessing the transparency level of the business entity's activities (Table 5).

Table 5. Four-step scale for assessing the transparency level of an entity's activities

The number of points according to the business entity's Transparency Index	Transparency level of the business entity's activities
39-0 points	unacceptably low level, characterised by the absence or brief disclosure of essential information (or disclosure of non-essential information), lack of information about investment, marketing, international, financial activities and prospects for the development of the enterprise.
59-40 points	low level, characterised by insufficient, low level of disclosure of essential information, inadequate coverage of the main key aspects (vectors) of the enterprise's activities.
79-60 points	medium-sufficient level, characterised by partial, incomplete, or delayed disclosure of essential information about the current activities and main results of the enterprise.
100-80 points	high level, characterised by complete and relevant disclosure of all essential information about key aspects (vectors) of the company's current activities and development prospects.

Source: compiled by the authors based on (Onishchenko, 2020)

The authors of this study propose to improve the system and structure of managing the transparency of banking institutions according to two separate levels of factor space and their cross-influence by improving the positioning mechanism of banking institutions through managing differences in two-level classification with

common patterns inherent in this process. Figure 1 shows the main stages, tasks, results, and methods of proposed diagnostics of transparency of business entities' activities based on multidimensional modelling and applied econometric methods using the example of banking institutions in Ukraine.

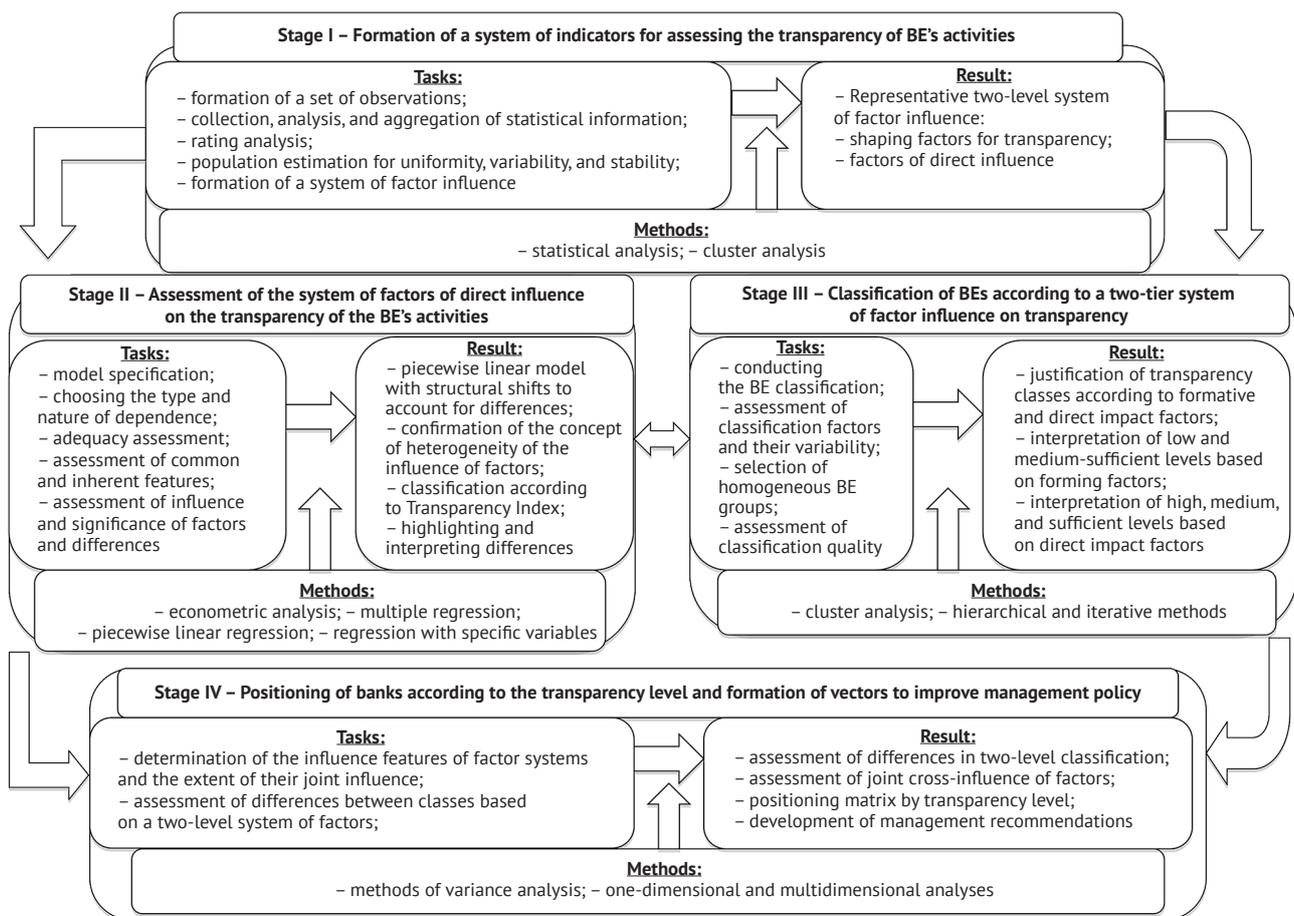


Figure 1. Stages of diagnostics of transparency level of the business entity's activities based on multidimensional modelling, applied econometric methods

Source: compiled by the authors

Next, the authors investigate the essential content of each of the stages of diagnosing the transparency level of a banking institution's activities.

Stage 1 – development of a system of indicators for assessing the level of transparency of business entities' activities.

The main tasks of this stage include estimation and appropriate monitoring of the total transparency of activity.

To solve these problems, the study uses statistical and cluster analysis methods.

Stage 2 – assessment of the system of factors of direct influence on the transparency of business entities' activities.

The main tasks to be solved at Stage 2 are as follows: to specify influence models; to choose the type and nature of dependence; to verify the adequacy of impact models; to estimate the general and inherent features of the population according to the system of influence factors; to evaluate the influence of factors and the significance of differences.

To solve these problems, the study uses the methodology of econometric modelling, namely multiple regression, piecewise linear regression, and regression with specific variables (Guryanova *et al.*, 2016; Maliarets, 2011).

Stage 3 – classification of business entities according to a two-level system of factor influence on transparency.

The main tasks to be solved at Stage 3 are as follows: to classify subjects, form groups and find patterns; to estimate classification factors and their variability; to find homogeneous groups of subjects; to evaluate the quality of classifications.

The authors employed cluster analysis to solve these problems (Klebanova *et al.*, 2018).

Stage 4 – positioning of banks according to the transparency level and development of vectors for improving management policies.

The main tasks to be solved at Stage 4 are as follows: to find the influence features of factor systems and the level of their joint impact; to estimate differences between classes according to the two-level system of factors; to form a transparency matrix; to form management decisions.

To solve these problems, the authors employed variance analysis (Shapran, 2019).

RESULTS AND DISCUSSION

An integral part of supporting a prominent level of transparency of financial flows in the country is their objective and correct assessment. Today, there are several methods for estimating the transparency level, which cover various links and subjects of the country's financial market.

At the beginning of the 21st century, E. Egbuna (2014) was one of the first to suggest the use of the Transparency Index. It included 11 variables that reflected the publicity of monetary policy, the degree of autonomy and independence of the central bank, the way information is presented, and the degree of assessment of the monetary regulation process.

Other researchers (Sylvester & Geraats, 2007) identified 5 transparency components as follows: familiarization with the objectives of monetary policy implementation (political transparency); the degree of openness of economic indicators (economic transparency); the level of publicity of monetary policy (procedural transparency); transparency of methods and techniques of monetary policy implementation (policy transparency); the level of operational openness (operational transparency). Binary indicators (0 and 1) were used during the evaluation. The advantages of using this method include the ease of determining the index; its adaptation to well-known theoretical developments regarding the types of transparency of the central bank; permissibility of use for any central bank (i.e., a high level of universality). But unfortunately, this method also had certain disadvantages. Thus, the central bank's transparency analysis is one-sided, considering only the event of the publication of data on its monetary policy activities. The criteria for analysing certain types of transparency are also not fully detailed. When performing calculations, only the availability of information is considered, without its completeness (Busko, 2016).

N. Dincer & B. Eichengreen (2014) subsequently used a similar technique to find the level of transparency. However, unlike its predecessors, which used information about 20 central banks, 150 central banks already served as the basis for analysis.

Now, one can observe an asymmetry of information related to the fact that banks, as commercial structures, have a certain probability of bankruptcy, which sometimes stays an unknown fact for its clients. In this case, using only financial indicators to evaluate the financial stability of banks may not be sufficient. In this regard, the importance of applying the transparency index increases.

The rating agency Standard & Poor's also proposed its methodology for assessing the transparency of banks (index of information transparency). Its essence lies in the maximum detail of the analysed indicators. A special feature of this method is the use of information obtained from several sources, which is considered when figuring out the final score for each evaluation criterion. Therewith, it is mandatory to consider the profitability of information from the standpoint of a foreign investor and publish indicators in several languages. The disadvantage of this methodology is its low level of transparency: the low level of consideration of the specifics of the legislation of different countries on regulating the transparency of banks; the inability to independently assess the bank; is not exhaustive for diagnosing the transparency of banking risks, since the publication of information on risk management includes a limited number of indicators without detailing them (Onishchenko, 2020).

Considering the previously discussed methods of investigating transparency for various research objects, to find the level of transparency of an enterprise's

activities, the authors of this study offer their methodological approach, which can be used to estimate the transparency of banking institutions using a group of criteria. The main advantage of the proposed method of diagnosing transparency over others is the objectification of research results through the widespread use of multidimensional analysis methods. The authors considered the main shortcomings of previous methods for measuring transparency. The proposed methodological approach provides an extensive number of criteria and sub-criteria that allow assessing the transparency of an enterprise's activities in various aspects of its activities (economic, legal, organisational, social, etc.). Furthermore, the applied transparency diagnostics can be chosen not only to figure out the transparency of banking institutions, but also other business entities, since the proposed transparency assessment criteria are universal.

Next, the authors investigate the results of each of the stages of the proposed method for diagnosing the transparency level of a banking institution's activities.

Stage 1 – development of a system of indicators for assessing the level of transparency of business entities'

activities. To perform diagnostics, the study selected a group of indicators that can be used in the rating assessment of the transparency level of banking institutions (14 indicators), namely, forming factors of transparency (Onishchenko, 2020) and a system of key indicators of banking institutions' performance – factors of direct influence (deposits, equity, assets, net profit) (Litvinchuk, 2019). A sample set of observations was checked for robustness and representativeness for the 20 banking institutions under study. For further research, factors X13 (cooperation of the BE with the media) and X14 (tax documents of the BE), which are unstable from the perspective of statistical analysis, were excluded.

Variables were also classified to assess the stability of a set of indicators using hierarchical cluster analysis (Fig. 2) (StatSoft e-textbook, n.d.). The X8 indicator (BE's financial statements) is quite separate, as it is also not variable. The group of indicators X1 (general information about BE), X2 (legal documents regulating the BE's activities), X4 (BE's marketing policy) form a separate cluster, since they have normal scattering and variability for the banks under study, which is considered and will be more investigated at the next stages of diagnosis.

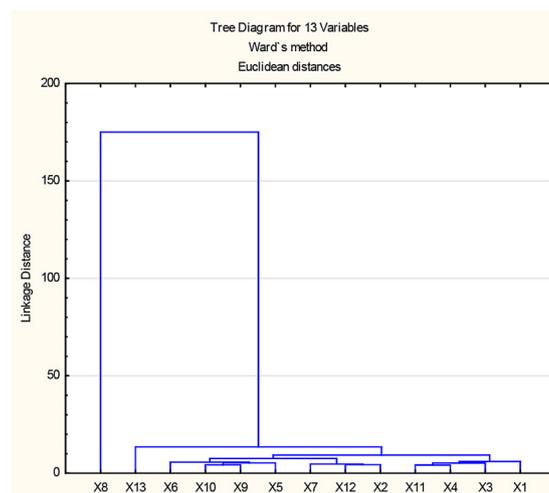


Figure 2. Dendrogram for classifying variables using hierarchical cluster analysis

Source: compiled by the authors

Thus, the result of this stage of diagnostics is a well-founded representative two-level system of factor influence on transparency: forming transparency factors and direct influence factors.

Stage 2 – assessment of the system of factors of direct influence on the transparency of business entities' activities.

The results of building a linear model of multiple regression analysis in the Statistica Application Software Package in the Multiple Regression module (StatSoft e-textbook, n.d.; Egbuna, 2014) are shown below. The inadequacy of the coupling model (coefficient of determination $d=0.2$) is confirmed by the heterogeneity of the initial data, their significant differences that make it impossible to combine them within one sample population,

which is required by a linear regression model. The scatter plot of variables and their statistical characteristics are presented in Figure 3.

The results of the study indicate that the initial data are heterogeneous. This allows assuming that the selected groups of banking institutions are confirmed according to certain indicators of direct influence factors.

With the help of Statistica (Nonlinear Estimation module), the authors built a piecewise linear regression to confirm the assumption of grouping and correspondingly obtain numerical values of the breakpoint of sets, as well as explain the differences in the level of transparency (StatSoft e-textbook, n.d.; Egbuna, 2014).

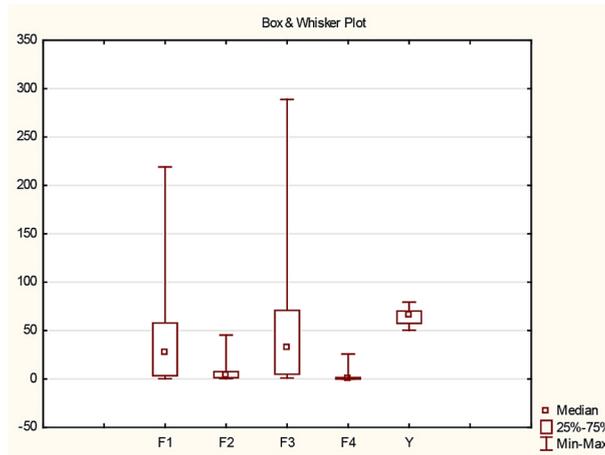


Figure 3. Scatter plot according to direct impact and transparency factors and their statistical characteristics
Source: compiled by the authors

Figure 4 shows the results of constructing a piecewise linear econometric model. The constructed model is adequate (the correlation coefficient is 0.96537, the determination coefficient is 0.9319).

Model is: Piecewise linear regression with breakpoint (Spreadsheet1)											
Dependent variable: Y Loss: Least squares											
Final loss:90,767173080 R= ,96537 Variance explained: 93,194%											
N=20	Const.B0	F1	F2	F3	F4	Const.B0	F1	F2	F3	F4	Breakpt.
Estimate	52,73477	-0,241127	2,820008	-0,004616	-1,58706	66,32458	-1,23987	-0,324704	1,202261	-2,04403	64,85000

Figure 4. Results of a piecewise linear econometric model for justifying differences in transparency assessment indicators
Source: compiled by the authors

Based on the results of the conducted econometric analysis, namely: multivariate regression analysis, piecewise linear regression construction and error analysis of the piecewise linear model, it was found that

the resulting model with extended criteria has a gap (corresponding to the point 64.85 for the value of the dependent variable (transparency level)). And the system of equations of the model is as follows (1):

$$y_{(xi)} = \begin{cases} 52.73 - 0.24 * f1 + 2.82 * f2 - 0.005 * f3 - 1.59 * f4, & \text{if } y_i^* \leq 64.85; \\ 66.32 - 1.24 * f1 - 0.32 * f2 + 1.20 * f3 - 2.04 * f4, & \text{if } y_i^* > 64.85; \end{cases} \quad (1)$$

where f1–f4 are dependent variables

transparency level of the indicator 64.85, which is confirmed by the adequacy of the model.

The difference in parameter values confirms the presence of structural shifts (differences), and therefore the heterogeneity of data and the use of more adaptive methods that consider specific effects for a particular group. This model determines the difference in the

Figure 5 presents a graph comparing the parameters of the general and piecewise linear regression models by groups, which is the basis for interpreting the differences.

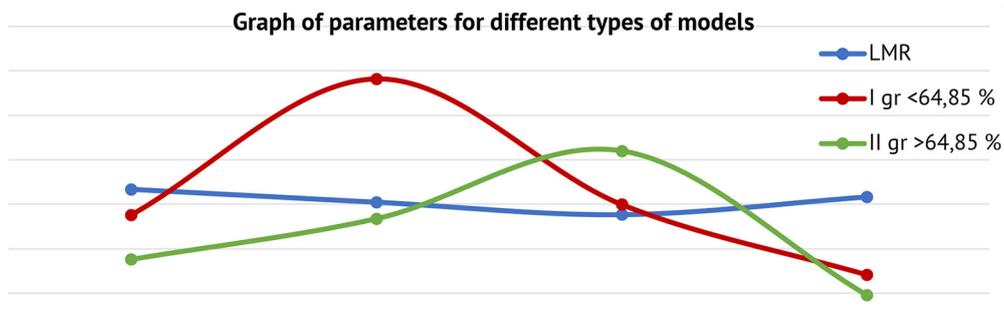


Figure 5. Graph comparing the parameters of the general and piecewise linear regression models by groups
Source: compiled by the authors

Figure 6 presents a graph comparing the empirical values of transparency and theoretical data according to models with a gap and general linear regression, which

confirms the hypothesis of using a model with a gap (piecewise-linear) for further research, and the development of recommendations considering the heterogeneity of groups.

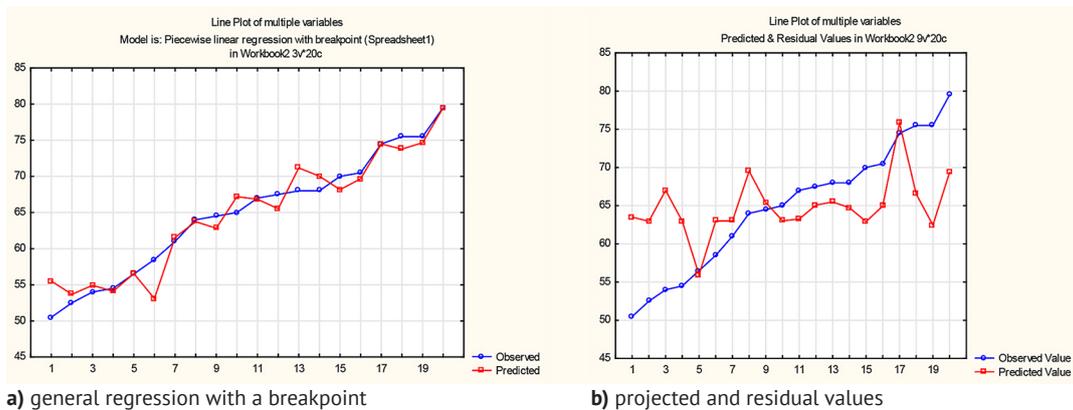


Figure 6. Graph of comparison of empirical values of transparency and theoretical data according to gap and general linear regression models

Source: compiled by the authors

Figure 7 presents the graphs of the dependence of the transparency level (dependent variable) on the impact factors for isolated groups of observations

according to the piecewise linear model, which confirms the hypothesis of further research of isolated groups with defined features of influence.

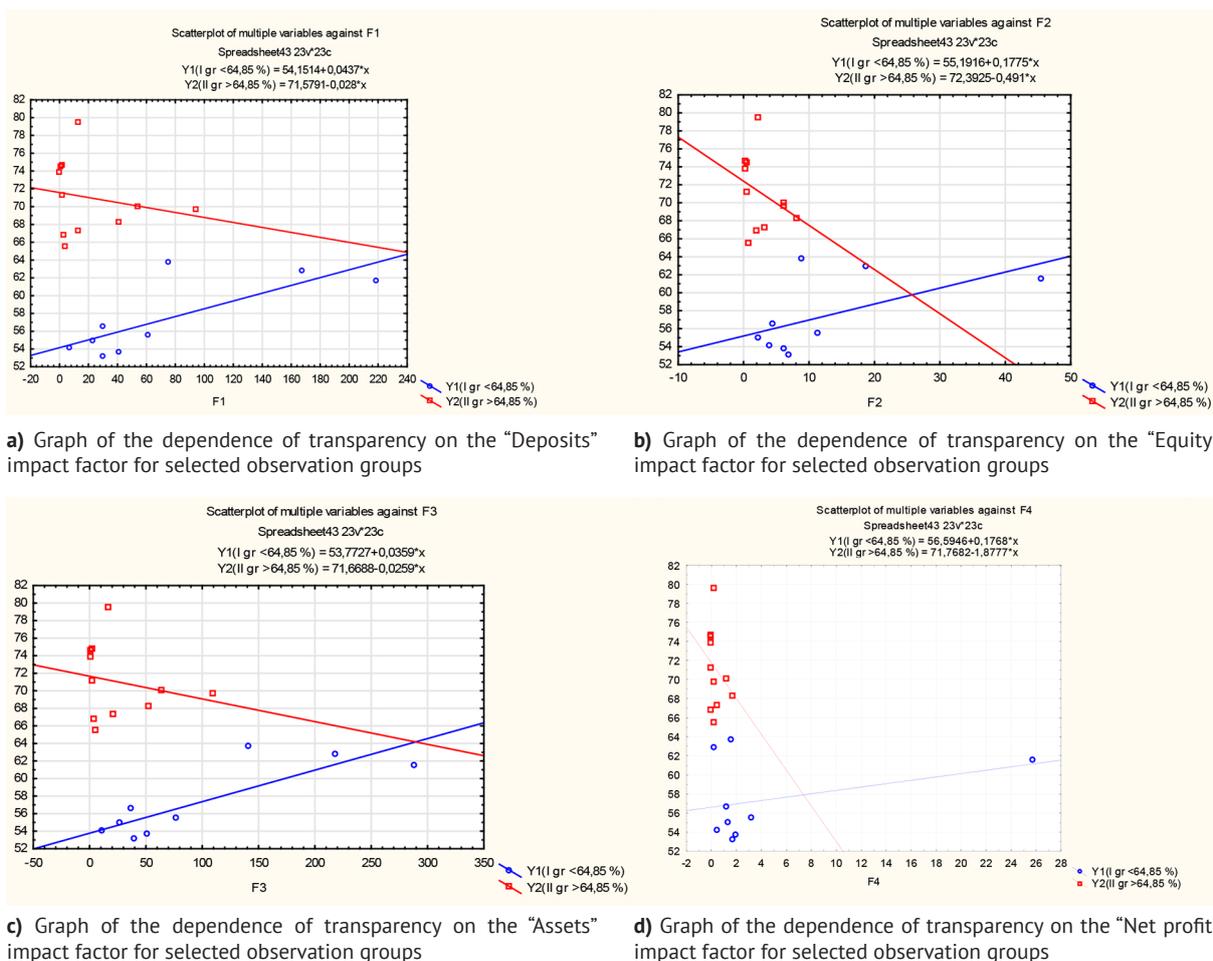


Figure 7. Graphs of the dependence of transparency on factors of influence for selected observation groups

Source: compiled by the authors

As a result of the simulation, two groups of banks were formed, which differ in the value of the transparency coefficient. The econometric model, which relates these values to the corresponding set of independent factors, is of particular importance.

Figure 7 presents the graphs of the dependence of transparency (dependent variable) on the impact factors for isolated groups of observations according to the piecewise linear model, which confirms the hypothesis of further research of isolated groups with defined features of influence. This allows finding the degree of change in the dependent variable (its increase by one unit provides a different level of increase in probability). Probit-model is based on the law of distribution (2).

$$F(z) = \Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2} dt \quad (2)$$

The probability distribution function of the logitics law has the following form (Eq. 3):

$$\Lambda(z) = \frac{e^z}{1 + e^z} \quad (3)$$

Based on the results of constructing the probit and logit function models, a model with a gap at point 60 in terms of transparency was tested, but this classification can be refuted, since there are substantial errors in the classification matrix regarding the assignment of banks to a particular group, considering only the rating indicator of transparency.

Figure 8 shows a graph comparing empirical values of transparency levels and theoretical data for probit and logit with models that reflect the probability of assignment to a particular class.

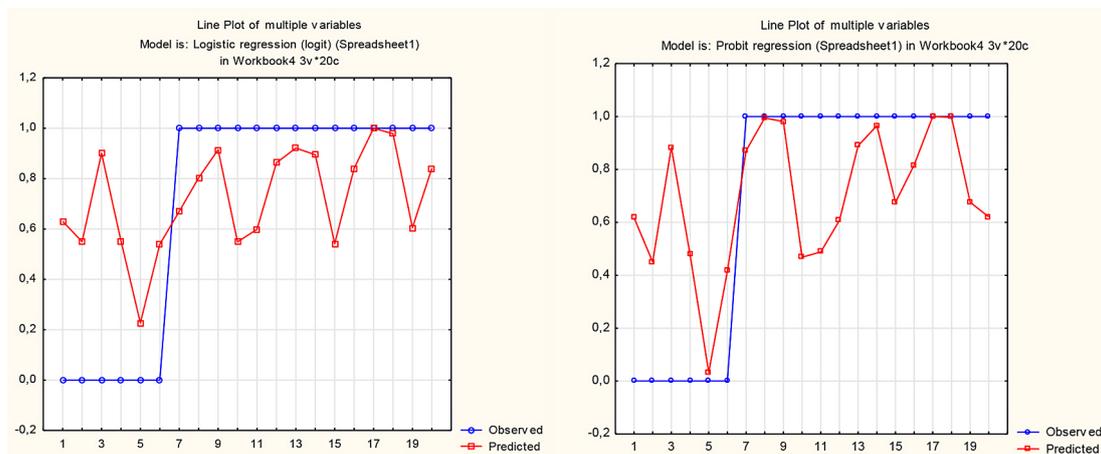


Figure 8. Graph of comparison of empirical values of transparency and theoretical data for probit and logit models
Source: compiled by the authors

Thus, the aggregated results of this stage of transparency diagnostics can be stated as follows:

- the hypothesis of structural heterogeneity of sample data based on piecewise linear regression is confirmed;
- the concept of heterogeneity of the influence of factors based on comparative analysis for different types of influence models is confirmed;
- a classification based on the effective transparency indicator was obtained and a comparative analysis of the breakdown by model was performed;
- features were identified, differences were highlighted and interpreted.

Stage 3 – classification of business entities according

to a two-level system of factor influence on transparency. The results of building models of cluster analysis of business entities by factors of transparency formation in Statistica are presented in Figures 9 and 10 without considering indicators X8 and X13, which are non-variable. This hierarchical tree classification serves as the basis for putting forward and confirming the hypothesis of the number of clusters according to transparency level. Classification dendrograms allowed identifying homogeneous groups of subjects and confirming the hypothesis about the presence of a certain structure in the set of objects under study and highlighting the features of the existing structure (StatSoft e-textbook, n.d.).

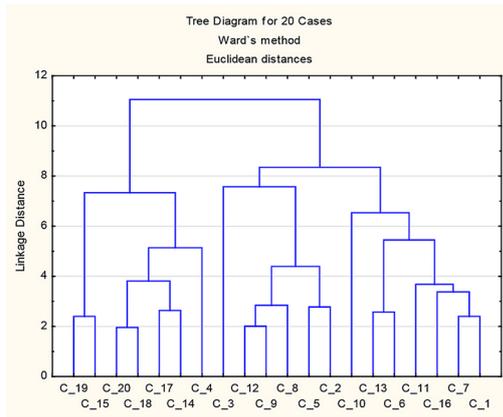


Figure 9. Dendrogram for classifying banks using the hierarchical cluster analysis method
 Source: compiled by the authors

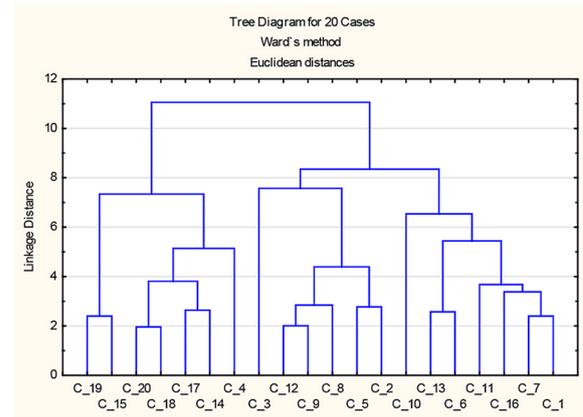


Figure 10. Dendrogram for classifying banks using the hierarchical cluster analysis method without indicators X8 and X13
 Source: compiled by the authors

For further studies and classifications, variables X8 and X13 were excluded, and a procedure for iterative clustering of K-averages was implemented to obtain all the necessary statistical characteristics and parameters. A graph of the

average values for clusters of states based on transparency factors is presented in Figure 11. The clusters differ most in terms of X2, X5–X10, X12, and less significant differences are observed in the averages for X3, X4, and X11 indicators.

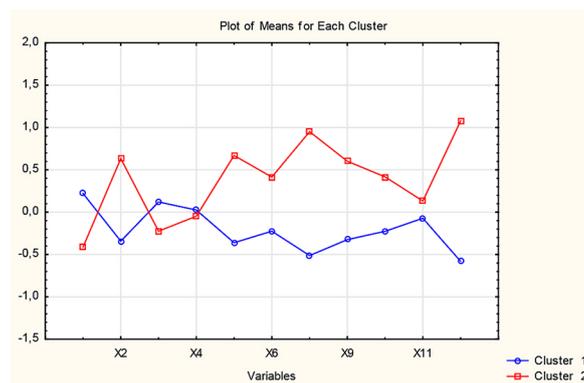


Figure 11. Graph of average values for state clusters based on transparency factors
 Source: compiled by the authors

The results of the authors' analysis of variance based on transparency factors are presented in Figure 12.

Parameters F and p determine the attribute's contribution to classification.

Variable	Analysis of Variance (Spreadsheet43)					
	Between SS	df	Within SS	df	F	signif. p
X1	1.81541	1	17.18459	18	1.90155	0.184801
X2	4.31711	1	14.68289	18	5.29242	0.033592
X3	0.53846	1	18.46154	18	0.52500	0.478030
X4	0.02470	1	18.97530	18	0.02343	0.880035
X5	4.83203	1	14.16797	18	6.13895	0.023365
X6	1.85714	1	17.14286	18	1.95000	0.179570
X7	9.74488	1	9.25513	18	18.95250	0.000383
X9	3.89955	1	15.10046	18	4.64832	0.044862
X10	1.87912	1	17.12088	18	1.97561	0.176880
X11	0.18585	1	18.81415	18	0.17780	0.678259
X12	12.50427	1	6.49573	18	34.65000	0.000014

Figure 12. Table of variance analysis by factors of transparency formation
 Source: compiled by the authors

Figure 13 shows descriptive statistics for the selected clusters, namely mean, root-mean-square deviation, and variance.

Variable	Descriptive Statistics for Cluster 1 (Spreadsheet43) Cluster contains 13 cases		
	Mean	Standard Deviation	Variance
X1	0.221080	0.946439	0.895747
X2	-0.340925	1.094248	1.197379
X3	0.120404	1.240347	1.538462
X4	0.025790	1.092154	1.192799
X5	-0.360684	0.834249	0.695971
X6	-0.223607	0.000000	0.000000
X7	-0.512213	0.878214	0.771260
X9	-0.324018	0.992069	0.984201
X10	-0.224926	0.987096	0.974359
X11	-0.070736	1.034758	1.070724
X12	-0.580219	0.735738	0.541311

a) Descriptive statistics for Cluster 1 according to transparency factors

The cluster members presented in Figure 14 and their distances to the centre of the corresponding cluster allow figuring out the composition of each cluster.

Variable	Descriptive Statistics for Cluster 2 (Spreadsheet43) Cluster contains 7 cases		
	Mean	Standard Deviation	Variance
X1	-0.410577	1.035666	1.072605
X2	0.633147	0.228891	0.052391
X3	-0.223607	0.000000	0.000000
X4	-0.047896	0.881448	0.776951
X5	0.669842	0.984575	0.969388
X6	0.415270	1.690308	2.857143
X7	0.951253	0.000000	0.000000
X9	0.601748	0.740500	0.548341
X10	0.417720	0.951190	0.904762
X11	0.131367	0.997118	0.994244
X12	1.077549	0.000000	0.000000

b) Descriptive statistics for Cluster 2 according to transparency factors

Figure 13. Descriptive statistics for clusters by transparency formation factors

Source: compiled by the authors

Members of Cluster Number 1 (and Distances from Respective Cluster contains 13 cases	
Case No.	Distance
C_2	0.832247
C_3	1.552021
C_4	1.051621
C_8	0.833603
C_9	0.664362
C_11	0.780460
C_12	0.716732
C_14	0.650129
C_15	0.779057
C_17	0.726298
C_18	0.792812
C_19	1.116850
C_20	0.927019

a) Cluster 1 according to formation factors

Members of Cluster Number 2 (and Distances from Respective Cluster contains 7 cases	
Case No.	Distance
C_1	0.649016
C_5	0.766295
C_6	0.681963
C_7	0.505970
C_10	1.219111
C_13	0.835141
C_16	0.739147

b) Cluster 2 according to formation factors

Figure 14. Bank cluster members and their distance to the centre of the cluster according to transparency formation factors

Source: compiled by the authors

Thus, Cluster 1 comprises 13 banking institutions that have lower average values for all indicators that form transparency, except for indicator X1 (general information about BE), X3 (BE's investment activity) and correspond to almost the same average level for indicator X4 (BE's marketing policy). This cluster is interpreted as a cluster with entities with a low transparency level. However, interpretation may have discrepancies, established according to the transparency scale proposed in this paper (Table 3), which have high average values for 7 of the 11 indicators of transparency formation under study.

According to the breakdown by factors of transparency formation, almost all institutions whose transparency rating is below 70 points belong to the low class. According to the results, one has an interval of 60-70 points by which banks can be classified, and it is

the ambiguity of the classification within this limit that gives rise to groups differing according to transparency. According to the piecewise-linear econometric model, to justify the degree of differences according to the indicators of the transparency level, the break point of 64.85 was also found, which is practically the middle of this interval. Thus, this fact confirms the need for further research and more detailed classifications on the level of transparency for various factors.

The authors of this paper will further investigate the grouping of banks according to the transparency level for the factors of direct influence to distinguish the general and individual features of the factors and patterns that dictate the transparency level.

The dendrogram of the classification of banks per the Ward's method by factors of direct influence is presented in Figure 15. Based on the results of the

tree classification, one can observe a breakdown into 3 clusters of states, which will serve as the basis for the hypothesis of investigating the classification into three groups based on these factors and their thorough analysis. A graph of the average values for clusters of states

by direct influence factors using the K-mean method is presented in Figure 16. Most of all, the clusters differ according to the indicator of the deposit portfolio (F1) and available assets (F3), the smallest differentiation according to the indicator of net profit (F4).

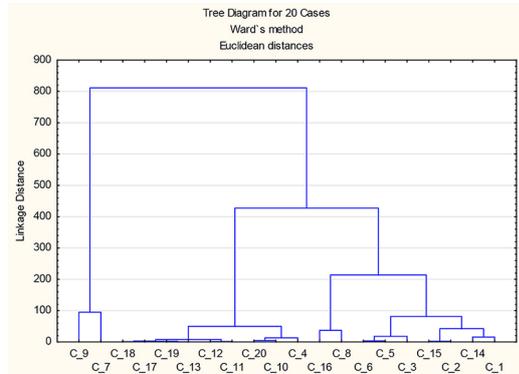


Figure 15. Dendrogram of the classification of banks per the Ward's method by factors of direct
Source: compiled by the authors

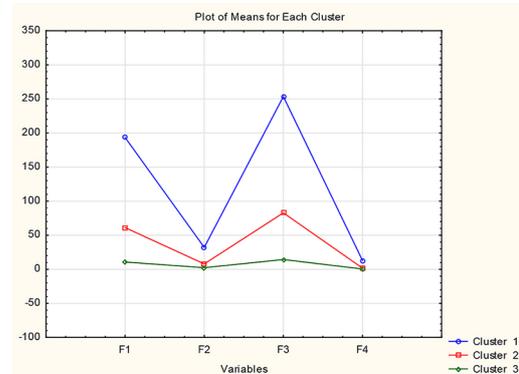


Figure 16. Graph of average values for state clusters by direct impact factors
Source: compiled by the authors

The table of variance analysis for direct influence factors confirms the significance of variables for classification according to the Fischer criterion (F), and a

sufficient level of differences between subjects for the factors under study (Fig. 17).

Variable	Analysis of Variance (Spreadsheet43)					
	Between SS	df	Within SS	df	F	signif. p
F1	59675.5	2	4864.73	17	104.2693	0.000000
F2	1522.1	2	426.94	17	30.3044	0.000002
F3	103041.4	2	11144.47	17	78.5908	0.000000
F4	269.6	2	336.19	17	6.8170	0.006700

Figure 17. Table of variance analysis by direct impact factors

Source: compiled by the authors

Therefore, the hypothesis regarding the three-class grouping of commercial banks according to the determining factors of activity, which are defined as factors of direct influence, can be confirmed. Members of bank clusters and their distance to the centre of the cluster

by factors of direct influence are presented in Figure 18 with the following components and interpretation:

- Cluster 1 – 2 banks – prominent transparency;
- Cluster 2 – 6 banks – average transparency;
- Cluster 3 – 12 banks – sufficient transparency;

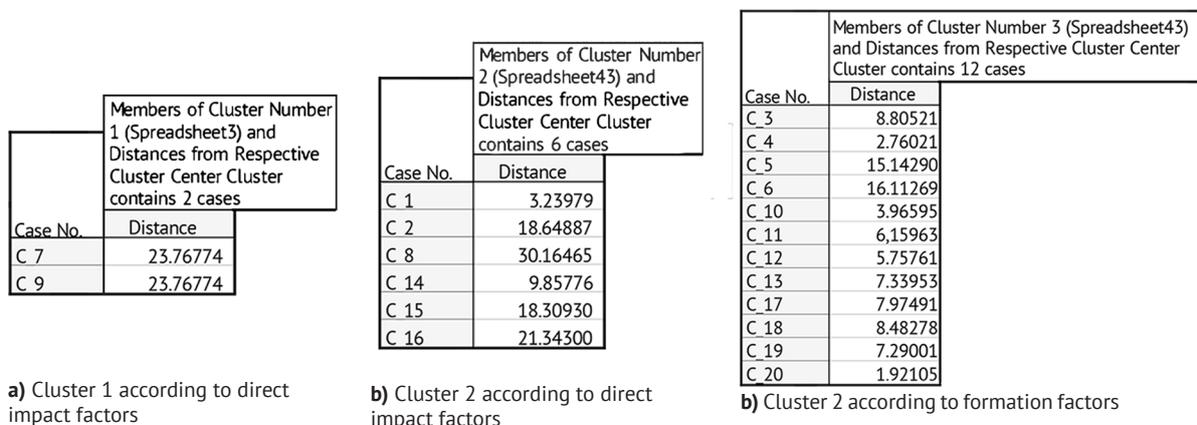


Figure 18. Bank cluster members and their distances to the cluster centre by direct impact factors

Source: compiled by the authors

The aggregated results of cluster analysis of indicators based on transparency factors and direct impact

factors based on the implemented methods are presented in Table 6.

Table 6. Aggregated results of cluster analysis of indicators based on factors of transparency and direct impact formation

	Bank	Transparency level	Based on transparency calculations	Standard Ward's method	Non-standard Ward's method	Method K-mean (without X8 and X13)	Method K-mean (F1-F4)
1	Raiffeisen Bank Aval JSC	75.50%	S-D	S-D	S-D	S-D	S
2	Ukrsibbank JSC	68.00%	S-D	S-D	S-D	N	S
3	Citibank JSC	67.50%	S-D	S-D	S-D	N	D
4	ING Bank Ukraine JSC	61.00%	S-D	N	S-D	N	D
5	Crédit Agricole Bank JSC	70.50 %	S-D	S-D	S-D	S-D	D
6	OTP Bank JSC	68.00%	S-D	S-D	S-D	S-D	D
7	Commercial Bank "PrivatBank" JSC	74.50%	S-D	S-D	S-D	S-D	V
8	Ukreximbank JSC	56.50 %	N	S-D	N	N	S
9	Oschadbank JSC	64.00%	S-D	S-D	S-D	N	V
10	ProCredit Bank JSC	75.50%	S-D	S-D	S-D	S-D	D
11	Pravex Bank JSC	70.00%	S-D	S-D	S-D	N	D
12	Idea Bank JSC	67.00%	S-D	S-D	S-D	N	D
13	Piraeus Bank JSC	65.00%	S-D	S-D	S-D	S-D	D
14	Alfa-Bank JSC	54.00%	N	N	N	N	S
15	FUIB (PUMB) JSC	64.50%	S-D	N	N	N	S
16	JSB UKRGASBANK PJSC	79.50%	S-D	S-D	S-D	S-D	S
17	SEB Corporate Bank JSC	54.50%	N	N	N	N	D
18	Credit Europe Bank JSC	52.50%	N	N	N	N	D
19	JSCB "Lviv" JSC	58.50%	N	N	N	N	D
20	Kredobank JSC	50.50%	N	N	N	N	D

Source: compiled by the authors

The comprehensive results of this stage of transparency level diagnostics, which lies in building factor space classification models, can be formulated as follows:

- justification of transparency classes by formative and direct impact factors;
- interpretation of the states of transparency of economic entities with a low and medium-sufficient level according to the forming factors;
- interpretation of the states of transparency of business entities with a high, medium, and sufficient level by factors of direct influence.

Thus, the implementation of cluster analysis tools for assessing transparency for selected factor systems solves the following diagnostic tasks:

- analysis of the specific features of implementing the factor potential of transparency by identifying homogeneous groups, which allows identifying the weaknesses and strengths of the banking sector in established areas within this market;

– reducing the dimension of data on qualitative signs of transparency by two levels of compliance with the “low” and “medium-sufficient” levels for forming factors and the “high”, “medium”, and “sufficient” levels for direct impact factors to justify the limits of a multi-level assessment of the impact of indicators on transparency of activities.

Stage 4 – positioning of banks according to the transparency level and development of vectors for improving management policies.

At this stage, the variability of factor space indicators was investigated according to two systems of transparency factors of banking institutions (StatSoft e-textbook, n.d.; Egbuna, 2014).

Figure 19 shows the difference in the values of the ranking index of transparency by the levels of formation factors and direct influence factors according to the methodology of univariate analysis of variance in Statistica in the ANOVA module (StatSoft e-textbook, n.d.).

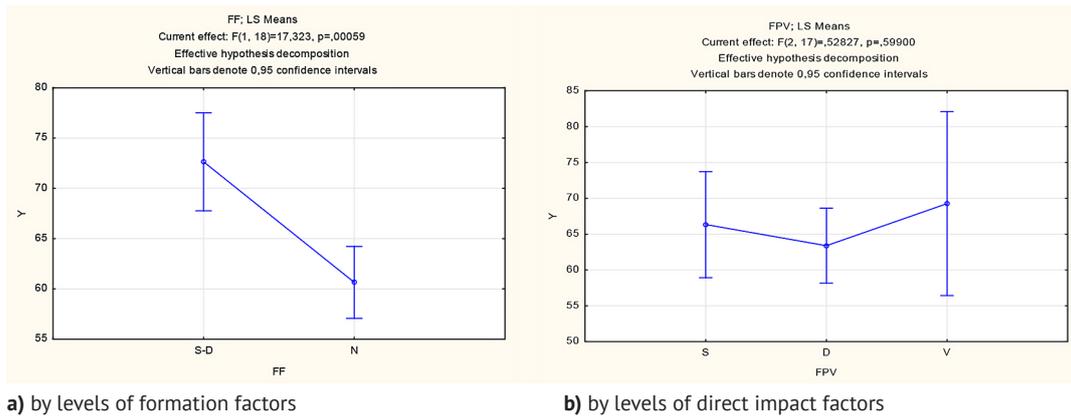


Figure 19. The difference between the values of the transparency rating indicator by the levels of factors of formation and factors of direct influence

Source: compiled by the authors

The table of results of variance analysis and analysis of main effects (Fig. 20) by factors of transparency formation, according to which two isolated groups with a low and medium-sufficient level were studied, confirms

the quality of the built model (Fisher’s criterion), since the value of the indicator in the groups is sufficiently different and the ranges of values do not overlap considering the errors.

FF; LS Means (Spreadsheet43) Current effect: F(1, 18)=17,323, p=,00059 Effective hypothesis decomposition						
Cell No.	FF	Y Mean	Y Std.Err.	Y -95,00%	Y +95,00%	N
1	S-D	72.64286	2.322337	67.76381	77.52191	7
2	N	60.65385	1.704130	57.07360	64.23409	13

a) analysis of variance

Univariate Tests of Significance for Y (Spreadsheet43) Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	80844.45	1	80844.45	2141.419	0.000000
FF	654.00	1	654.00	17.323	0.000585
Error	679.55	18	37.75		

b) main effects analysis

Figure 20. Table of results of variance analysis and analysis of the main effects by factors of transparency formation

Source: compiled by the authors

The table of results of variance analysis and analysis of main effects (Fig. 21) by factors of direct influence, by which three isolated groups with an average, sufficient, and high level of transparency are investigated, confirms the sufficient quality of the built model. However, it is worth noting the significant influence of environmental factors that are not considered in models. The calculated averages and ranges of their changes show a

lower, albeit sufficient, level of variability compared to transparency factors.

The graph of changes in the average values of the dependent variable (rating transparency indicator) depending on two qualitative aggregate factor features is presented in Figure 22, the results of a two-factor analysis of variance to assess the quality of the model are presented in Figure 23.

FPV; LS Means (Spreadsheet43) Current effect: F(2, 17)=,52827, p=,59900 Effective hypothesis decomposition						
Cell No.	FPV	Y Mean	Y Std.Err.	Y -95,00%	Y +95,00%	N
1	S	66.33333	3.508422	58.93121	73.73546	6
2	D	63.37500	2.480829	58.14091	68.60909	12
3	V	69.25000	6.076766	56.42914	82.07086	2

a) analysis of variance

Univariate Tests of Significance for Y (Spreadsheet43) Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	52779.22	1	52779.22	714.6411	0.000000
FPV	78.03	2	39.01	0.5283	0.598996
Error	1255.52	17	73.85		

b) main effects analysis

Figure 21. Table of results of variance analysis and analysis of the main effects by direct impact factors
Source: compiled by the authors

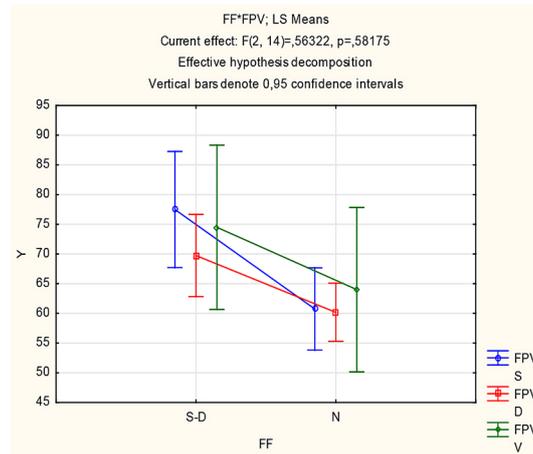


Figure 22. Cross-sectional analysis of two aspects by levels of formation factors and direct impact factors
Source: compiled by the authors

Univariate Tests of Significance for Y (Spreadsheet43) Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	52926.31	1	52926.31	1272.117	0.000000
FF	433.65	1	433.65	10.423	0.006067
FPV	76.33	2	38.16	0.917	0.422325
FF*FPV	46.87	2	23.43	0.563	0.581754
Error	582.47	14	41.60		

Figure 23. Results of two-factor cross-variance analysis

Source: compiled by the authors

Figure 24 shows a table with the values of average, and other statistics according to the level of change in intergroup transparency factors.

Thus, there are six groups of banking institutions that can be used to analyse changes in the level of transparency.

Cell No.	FF*FPV; LS Means (Spreadsheet43) Current effect: F(2, 14)=,56322, p=,58175 Effective hypothesis decomposition						
	FF	FPV	Y Mean	Y Std.Err.	Y -95,00%	Y +95,00%	N
1	S-D	S	77.50000	4.560971	67.71769	87.28231	2
2	S-D	D	69.75000	3.225093	62.83286	76.66714	4
3	S-D	V	74.50000	6.450187	60.66573	88.33427	1
4	N	S	60.75000	3.225093	53.83286	67.66714	4
5	N	D	60.18750	2.280485	55.29635	65.07865	8
6	N	V	64.00000	6.450187	50.16573	77.83427	1

Figure 24. Comparison of the values of the dependent variable (transparency rating) to the isolated groups by factors
Source: compiled by the authors

The given results indicate a difference between the average values in the groups for the corresponding intergroup factors. To verify the significance of differences,

a posteriori equalisations are used in groups to check the difference in averages. Figure 25 shows the significance levels of the mean equality hypothesis.

Cell No.	LSD test; variable Y (Spreadsheet43) Probabilities for Post Hoc Tests Error: Between MS = 41,605, df = 14,000							
	FF	FPV	{1} 77.500	{2} 69.750	{3} 74.500	{4} 60.750	{5} 60.188	{6} 64.000
1	S-D	S		0.187012	0.709826	0.009579	0.004355	0.109534
2	S-D	D	0.187012		0.520795	0.068542	0.029654	0.438571
3	S-D	V	0.709826	0.520795		0.077298	0.055140	0.268984
4	N	S	0.009579	0.068542	0.077298		0.888787	0.659130
5	N	D	0.004355	0.029654	0.055140	0.888787		0.586147
6	N	V	0.109534	0.438571	0.268984	0.659130	0.586147	

Figure 25. A posteriori equalisations for two factors

Source: compiled by the authors

Thus, the most considerable differences are observed in three groups of banks, the banks of the “medium-sufficient level” cluster in terms of transparency formation factors and “medium” in terms of direct influence factors differ from the “low-medium” and “low-sufficient” clusters in terms of the corresponding set of factors. There is a significant difference in the level of transparency for the “medium-sufficient – sufficient” level according to the two-level system of factors and the “low-sufficient” level according to the corresponding set of factors.

The calculations results show a relationship between transparency indicators. This allowed obtaining the following conclusions:

1) cluster banks with a low level of formation factors, but an average and sufficient level of influence factors,

have the lowest level of transparency. Banks belonging to the “medium-sufficient – medium level” cluster (Raiffeisen Bank Aval, UKRGASBANK) have the greatest positive level of transparency;

2) the deviation of the importance of transparency is determined considering the forming factors: the highest values of transparency are characteristic of state banks, and the lowest values are for 40% of banks (8 banks) from the population under study;

3) a cross-sectional two-aspect assessment of the level of transparency and factors of influence and formation indicates sufficient discrepancies for the obtained 6 groups.

Table 7 shows the matrix of banks' positioning by level of transparency according to a two-level system of factors, which is necessary for further analysis and implementation of relevant management decisions.

Table 7. Matrix of positioning of banks according to the level of transparency per the two-level system of factors

Level of transparency by direct impact factors	High	Oschadbank JSC	Commercial Bank “PrivatBank” JSC
	Average		Ukrsibbank JSC Ukreximbank JSC Alfa-Bank JSC FUIB (PUMB) JSC
Sufficient		Citibank JSC ING Bank Ukraine JSC Pravex Bank JSC Idea Bank JSC SEB Corporate Bank JSC Credit Europe Bank JSC JSCB “Lviv” JSC Kredobank JSC	Crédit Agricole Bank JSC OTP Bank JSC ProCredit Bank JSC Piraeus Bank JSC
		Low level	Medium-sufficient level
	Level of transparency by influencing factors		

Source: compiled by the authors

The results of the stage of positioning banks according to the level of transparency allowed figuring out the differences for the population under study and testing the hypothesis regarding the influence of individual factors and establishing their relationship at the appropriate level of significance, namely:

- evaluation of differences in two-level classification;
- assessment of joint cross-influence of factors;
- construction of a matrix of positioning according to levels of transparency depending on the system of assessment factors;
- development of management recommendations on ways to improve transparency policies.

CONCLUSIONS

The considered scientific and methodological approach, which can be used to diagnose the level of transparency of banks' activities, substantially expands the set of transparency indicators. A comprehensive estimation of the current state of transparency improves the system of effective management of both the individual bank, the sample population, and the banking system as a whole.

The introduction of this diagnostic technology in practical management activities allows finding many states of transparency; anticipating possible changes in states and identifying problems in the activities of banking institutions in a timely manner; developing

appropriate measures in advance to prevent and avoid a decrease in the level of transparency.

The given scientific-methodical approach to managing transparency based on identified factors of formation and influencing factors will enable managers to improve the quality and efficiency of management decisions, as it provides a thorough diagnosis of the level of transparency based on a set of indicators, considering their differences and commonalities. Furthermore, it provides assessment and analysis, classification by level of transparency according to a two-level system of factors. The given scientific and methodological approach serves as the basis for the future formation and implementation of the selection of activity scenarios of the behaviour of banking institutions based on a two-level matrix of positioning and implementation of managerial decisions in the improvement of management, as a single systemic process of activity development in the banking market.

The proposed approach to estimating the level of transparency of a business entity's activities can be implemented when compiling ratings of various companies by economic sectors. The goals of the rating in this case include identifying the most transparent companies in Ukraine, determining the average level of transparency of Ukrainian business, finding ways and developing measures to increase the level of transparency of Ukrainian companies.

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Анотація. У зв'язку з недосконалим станом трансформаційних перетворень в фінансовій системі України та банківському секторі, наявна стійка тенденція до збільшення кількості фінансово неспроможних підприємств у різних галузях; особливо це стосується банківського ринку, де за останні роки відбулися досить значні зміни якісного та кількісного характеру. Метою дослідження є вивчення проблеми управління діяльності банківських установ за допомогою діагностики рівня транспарентності їх діяльності. Методологія дослідження полягає у формуванні системи показників оцінки рівня транспарентності діяльності суб'єктів господарювання, оцінюванні рівня прямого впливу на рівень транспарентності, здійсненні класифікації суб'єктів господарювання за дворівневою системою факторів впливу на транспарентність. Заключним етапом методології є позиціонування банків за рівнем транспарентності для формування напрямів удосконалення політики управління транспарентністю. Поєднання методів багатовимірного аналізу, а саме прикладних економетричних методів, кластерного та дисперсійного аналізу, дозволяє класифікувати суб'єкти господарювання за рівнем транспарентності з урахуванням диференціації. Результатом проведеної диференціації є матриця позиціонування банківських установ за рівнем транспарентності за дворівневою системою факторів. Запропонований науково-методичний підхід до розрахунку рівня транспарентності суб'єкта господарювання, а саме банківських установ, що включає в себе, крім фінансового блоку, інші критерії, дозволяє набагато ширше дослідити стан діяльності суб'єкта господарювання. Використання цього науково-методичного підходу сприяє зниженню рівня інформаційної асиметрії, підвищенню гнучкості реакції суб'єкта господарювання на зовнішні шоки, що підвищує довіру до суб'єктів господарювання, поліпшує їх ділову репутацію та неодмінно відображається на фінансових показниках. Позитивні покращення в фінансових показниках окремих суб'єктів господарювання, підвищення рівня гнучкості та довіри до них сприятимуть підвищенню рівня транспарентності фінансових потоків, які переміщуються в країні

Ключові слова: асиметрія, банк, прозорість, суб'єкт господарювання, фінансові потоки