

Ministry of Education and Science of Ukraine
Sumy State University
Education and Research Institute of Business, Economics, and Management
Economic Cybernetics Department

BACHELOR'S QUALIFICATION WORK

on the topic: «MODELING THE INTEGRAL TAXONOMIC INDICATOR
OF THE EFFICIENCY OF BANK ACTIVITY»

Completed a 4th year student, group AB-71-8a,

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ABSTRACT

qualifying work on the topic:

«MODELING THE INTEGRAL TAXONOMIC INDICATOR OF THE EFFICIENCY OF BANK ACTIVITY»

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The banking system is an economic component of any country and plays an important role in the development of the state. Ukraine's economy depends on the efficiency of the banks. The activities of banks need to improve and increase efficiency, eliminate the negative phenomena that usually occur in the banking sector. Future development requires clear and informed decision-making and adequate treatment of further changes in the environment. After all, the system of analysis of banks in Ukraine must directly change. Having read the information on banking analysis and the current situation in the banking sector, it is important to evaluate the analysis of the bank's performance using an integrated taxonomic approach that determines the normalization of input factors and their distribution.

The purpose of this qualification work is to build a model of an integrated taxonomic indicator of bank efficiency.

Object of research: indicators of bank efficiency.

Subject of research: methods and models for evaluating the efficiency of the bank.

The objectives of the study are:

1. Selecting input variables.
2. Normalizing input variables.
3. Dividing the input variables into stimulators and destimulators.
4. Determining the coordinates of the reference vector.
5. Determining the distances between the individual elements of the matrix of standardized values of input variables and the reference vector in the specific year.

6. Calculating the integrated taxonomic indicator in the specific year.
Recognizing the level of integrated taxonomic indicator.

7. Constructing the dynamics of the integrated taxonomic indicator. Draw conclusions.

To achieve the goals and objectives of the study, the following research methods were used: general information collected during the study of efficiency indicators of the bank; methods and models for evaluating the efficiency of the bank; checking the adequacy of the model and proposals for its use; generalization of the received information; analysis of the integrated taxonomic indicator.

The information base of qualification work is: bank's financial reporting, scientific articles, textbooks, monographs.

The obtained results can be used in banking.

Keywords: bank, efficiency, financial reporting, integral taxonomic indicator.

The content of the qualification work is presented on 17 pages. The list of used sources from 40 names is placed on 4 pages. The work contains 5 tables and 1 figure.

Year of qualification work - 2021.

Year of work protection - 2021.

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“__” _____ 2021 year

TASKS

FOR THE BACHELOR'S QUALIFICATION WORK

Student ___4___ course Group ___AB-71-8a___

course number

group code

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(first name, surname)

1. Theme of work «*Modeling the integral taxonomic indicator of the efficiency of bank activity*» is approved by the order of the university from “__” _____ 2021 №___
2. The deadline for students to submit completed work "18" is June 2021.
3. The purpose of the qualification work is to build a model of an integrated taxonomic indicator of bank efficiency.
4. Object of research: indicators of bank efficiency.
5. Subject of research: methods and models for evaluating the efficiency of the bank.

6. Qualification work is performed on the materials of the bank's financial reporting.

7. Indicative plan of qualification work, terms of submission of sections to the head and the maintenance of tasks for performance of the set purpose.

Section 1. General characteristics of the object of study and construction of a mathematical model

In section 1, consider the subject area, identify the most important indicators of bank efficiency, review the current state of modeling the evaluation of bank efficiency, set the task of modeling an integrated taxonomic indicator of bank efficiency.

Section 2. Checking the adequacy of the model and suggestions for its use

In section 2, check the adequacy of the constructed mathematical model, develop a method of design calculations, automate the method of calculations.

8. Consultations on work:

Section	Surname, initials and position of the consultant	Signature, date	
		task issued	task accepted
1	Kuzmenko O.V.		
2	Kuzmenko O.V.		
3	Kuzmenko O.V.		

9. The date of issuance of the task is "01" March 2021.

Head of qualification work _____ Gritsenko K.G.

Tasks to perform received _____ Dehtiar A.K.

CONTENT

INTRODUCTION.....	3
SECTION 1. GENERAL CHARACTERISTICS OF THE OBJECT OF RESEARCH AND CONSTRUCTION OF MATHEMATICAL MODEL	4
1.1 The essence and statement of the problem of efficiency of the bank.....	4
1.2 Formation of requirements to the model	9
1.3 Development of a mathematical model.....	10
SECTION 2. CHECKING THE ADEQUACY OF THE MODEL AND SUGGESTIONS FOR ITS USE.....	14
2.1 Study of the bank using the developed model.....	14
2.2 Checking the adequacy of the constructed mathematical model	17
CONCLUSIONS.....	19
REFERENCES.....	21

INTRODUCTION

The banking system is an economic component of any country and plays an important role in the development of the state. Ukraine's economy depends on the efficiency of the bank. The activities of banks need to improve and increase efficiency, eliminate the negative phenomena that usually occur in the banking sector. Future development requires clear and informed decision-making and adequate treatment of further changes in the environment. After all, the system of analysis of banks in Ukraine must directly change. Having read the information on banking analysis and the current situation in the banking sector, it is important to evaluate the analysis of the bank's performance using an integrated taxonomic approach that determines the normalization of input factors and their distribution into stimulants and disincentives; formation of a reference vector and construction of a generalizing taxonomic indicator.

The purpose of the qualification work: building a model of an integrated taxonomic indicator of bank efficiency.

Object of research: indicators of bank efficiency.

Subject of research: methods and models for evaluating the efficiency of the bank.

SECTION 1. GENERAL CHARACTERISTICS OF THE OBJECT OF RESEARCH AND CONSTRUCTION OF MATHEMATICAL MODEL

1.1 The essence and statement of the problem of efficiency of the bank

The information base of the study is the financial statements of Oschadbank JSC for 2013-2017 [3].

The urgency of implementing the efficiency of banks is due to the instability of the economic situation in the country, which creates a significant number of risks that banks are forced to take in the process of banking operations and services. Expanding the capabilities of banking operations and increasing the performance of banking causes the need to use the latest methods. As a result, crises in banks ceased to be accidental, they became an ongoing process. Based on this, the topical issue is to solve problems related to identifying performance indicators of the bank.

The efficiency of the bank is a difficult concept, because it applies to all, without excluding areas and areas of the bank. A modern bank performs many different operations. The efficiency of the bank - an increase in the results of the bank through the implementation of measures to improve it.

To assess the effectiveness of the bank, it is proposed to use a taxonomic approach that includes the following stages [4, c. 360]:

- 1) normalization of data, which involves the rationing of selected indicators in order to bring them to a single comparable form;
- 2) distribution of indicators on stimulants and destimulators;
- 3) the formation of the reference vector;
- 4) construction of a generalized taxonomic indicator.

The calculation of the taxonomic indicator is based on the following indicators:

- instant liquidity (H4);
- current liquidity (H5);

- short-term liquidity (H6);
- total liquidity (L);
- equity ratio (ER);
- regulatory capital adequacy (H2);
- return on assets (ROA);
- return on equity (ROE);
- net interest margin (NIM);
- standard of investment in securities (H11);
- standard of the total amount of investment (H12);
- rate of return on investment (RI).

These indicators are in the center attention, first of all, to the owners of the bank, because the rate of return on assets characterizes the efficiency of bank managers, and the rate of return on capital shows the level of return on investment by shareholders and serves as a guide for choosing the most attractive investment. Therefore, the higher the value of these indicators, the greater the profitability of the bank.

The bank's liquidity ratios characterize its ability to meet all estimated costs, such as financing loans or making payments on liabilities, using only liquid assets [9]. Instantaneous liquidity determines a bank's ability to meet short-term liabilities using the most liquid assets [10]. Current liquidity determines the bank's ability to meet short-term and long-term liabilities [11]. Short-term liquidity is an assessment of how well a bank manages its own funds and can meet its short-term financial obligations [12].

Capital ratios are set by the National Bank of Ukraine in order to ensure control over the indicators that characterize the bank's capital - the ratio of the minimum size of regulatory capital, the regulatory capital adequacy ratio, the ratio of regulatory capital to total assets [13, 14].

Profitability indicators - characterize the profitability of the bank, which is determined by the difference between the amount of profit received from assets and the cost of liabilities [15].

ROA characterizes the efficiency of the bank's assets [16].

ROE shows the efficiency of the bank's equity and compares the return on shareholders with the capital owned by shareholders [17]. These indicators reflect the degree of efficiency of the bank's own resources.

Return on assets (ROA) - the percentage of net profit of the bank to its net assets [34].

$$ROA = \frac{\text{net profit}}{\text{net assets}} * 100\%$$

This indicator is used to assess the management of the bank.

Return on equity (ROE) - the percentage of net income of the bank to its equity.

$$ROE = \frac{\text{net profit}}{\text{equity}} * 100\%$$

The ratio characterizes the efficiency of the bank's use of equity.

Investment standards are set by the National Bank of Ukraine to ensure control over the investment activities of banks (investment in securities separately for each institution - H11 (not more than 15%), the total amount of investment - H12 (not more than 60%) [18].

The input variables for the calculation of the integrated taxonomic indicator of the efficiency of the bank are shown in table 1.1-1.2.

Table 1.1 - Description of input variables

Variable (designation)	Name	Indicators for calculation (designation)	Economic content of the indicator	Calculation formula
x_1	$H4$	F_{ca}	Funds on correspondent account, UAH	$\frac{F_{ca} + Cash}{C_{liabilities}} \cdot 100\%$
		$Cash$	Cash on hand, UAH	
		$C_{liabilities}$	Bank liabilities accounted for in current accounts,	

			UAH	
x_2	$H5$	A	Bank assets with a final maturity / sale of up to 31 days, UAH	$\frac{A}{L_{current}} \cdot 100\%$
		$L_{current}$	Liabilities of the bank with a final maturity / sale term of up to 31 days, UAH	
x_3	$H6$	A_l	Bank assets with a final maturity / sale of up to 1 year, UAH	$\frac{A_l}{L_{short-term}} \cdot 100\%$
		$L_{short-term}$	Liabilities of the bank with a final maturity / sale of up to 1 year, UAH	
x_4	L	A_{hl}	Highly liquid assets, UAH	$\frac{A_{hl}}{F_b + F_{le} + F_i} \cdot 100\%$
		F_b	Funds of other banks, UAH	
		F_{le}	Funds of legal entities, UAH.	
		F_i	Funds of individuals, UAH	
x_5	ER	EQ	Equity, UAH.	$\frac{EQ}{Net A} \cdot 100\%$
		$Net A$	Net assets, UAH	
x_6	$H2$	RC	Regulatory capital, UAH	$\frac{RC}{A_r + A_{ocp} - UCR} \cdot 100\%$
		A_r	Assets reduced by the amount of the reserve, unencumbered NBU bonds and NBU debt securities weighted by risk ratio, UAH	
		A_{ocp}	The amount of the bank's open currency position, UAH	
		UCR	Uncovered credit risk, UAH	
x_7	ROA	$NP/Loss$	Net profit / loss, UAH.	$\frac{NP / Loss}{TA} \cdot 100\%$
		TA	Total assets	
x_8	ROE	$NP/Loss$	Net profit / loss,	$\frac{NP / Loss}{EQ} \cdot 100\%$

			UAH	
		EQ	Total equity, UAH	
x_9	NIM	II	Interest income, UAH	$\frac{(II - IE)}{TA} \cdot 100\%$
		IE	Interest expenses, UAH	
		TA	Total assets, UAH	
x_{10}	$H11$	F_{inv}	Bank funds invested in the purchase of shares, investment certificates separately for each institution, UAH	$\frac{F_{inv}}{AC} \cdot 100\%$
		AC	Authorized capital, UAH	
x_{11}	$H6$	$F_{inv-all}$	Bank funds invested for the purchase of shares, investment certificates of all legal entities, UAH	$\frac{F_{inv-all}}{AC} \cdot 100\%$
		AC	Authorized capital, UAH	
x_{12}	RI	NRI	Net return on investment, UAH	$\frac{NRI}{IC} \cdot 100\%$
		IC	Invested capital, UAH	

Table 1.2 – Values of input variables

Indicator (designation)	Economic content	Measurement scale	Valid values	Source
H4	Instant liquidity	%	[0; +∞)	Oschadbank reporting, 2013 - 2017
H5	Current liquidity	%	[0; +∞)	Oschadbank reporting, 2013 - 2017
H6	Short-term liquidity	%	[0; +∞)	Oschadbank reporting, 2013 - 2017
L	Total liquidity	%	[0; +∞)	Analysis of Ukrainian banks [5]
ER	Equity adequacy ratio	%	[0; 100)	Oschadbank reporting, 2013 - 2017
H2	Regulatory capital adequacy	%	[0; 100)	Oschadbank reporting, 2013 -

				2017
ROA	Return on assets	%	$(-\infty; +\infty)$	Analysis of Ukrainian banks [6]
ROE	Return on equity	%	$(-\infty; +\infty)$	Analysis of Ukrainian banks [36]
NPM	Net percentage margin	%	$(-\infty; +\infty)$	Analysis of Ukrainian banks [37]
H11	The norm of investing in securities	%	$[0; +\infty)$	Oschadbank reporting, 2013 - 2017
H12	Standard of the total amount of investment	%	$[0; +\infty)$	Oschadbank reporting, 2013 - 2017
RI	Rate of return on investment	%	$(-\infty; +\infty)$	Oschadbank reporting, 2013 - 2017

1.2 Formation of requirements to the model

Mathematical calculations and model construction are performed using a spreadsheet MS Excel, which thanks to the built-in functions and tools will speed up the calculation process [35].

Advantages of the MS Excel editor:

- effective analysis of data processing;
- means of formatting and reproducing data;
- printing spreadsheets;
- use of data and work on documents;
- exchange of data and information via the Internet and internal networks.

The software can be used for solving both large and small problems.

Therefore, the purpose of this study is to develop and implement a mathematical model that allows the effectiveness of the bank.

The process of creating a mathematical model is called mathematical modeling. This is the most common and most widely used research method in science, in particular in cybernetics. In general, the process of building a mathematical model of the system consists of the following stages [26]:

- Formation of the problem: determining the purpose of the study, the formation of properties that must be included in the model;
- Construction of a mathematical model: definition and description of input variables, definition of requirements and limitations of the model;
- Conducting research using the developed model;
- Checking the adequacy of the model;
- Analysis of results, development of proposals for further application and improvement.

We will consider the environment of Oschadbank on the basis of the development of the banking system of Ukraine.

The model is created in order to implement the efficiency of the Oschadbank, can also be used by other banks, financial institutions, and later in addition or change by various organizations.

The model allows to implement the level of efficiency of the bank. Also, the model helps to simplify the process of overall efficiency of the bank. The model of efficiency of the bank's activity must be accurate to reflect its real state, to be the basis for changes, corrections, for further use if necessary.

Therefore, the model of the bank's efficiency must meet the requirements to be useful in use and, if necessary, to be a source for further research of the bank's activity.

1.3 Development of a mathematical model

Mathematical model - a set of mathematical functions (equations, formulas, graphs), which determine the characteristics and behavior of the bank.

For convenience of construction of model it is necessary to make in the systematized kind input, output variables which are resulted in the corresponding tables (tab. 1.2).

For the indicators used in the study, we build a table, which indicates the scales of their measurement, allowable values, sources of formation of the set of input data (Table 1.3).

Normalization of the input variable x_i is performed by dividing the difference between the actual value of the input variable and its arithmetic mean value for the studied period of time by the standard deviation [19, c. 11]:

$$z_{ij} = \frac{x_{ij} - \bar{x}_i}{\sigma_i}, \quad i = \overline{1, m}, \quad j = \overline{1, n} \quad (1)$$

$$\bar{x}_i = \frac{1}{n} \sum_{j=1}^n x_{ij}, \quad \sigma_i = \sqrt{\frac{1}{n} \sum_{j=1}^n (x_{ij} - \bar{x}_i)^2}$$

where z_{ij} – normalized value of the i -th input variable in the j -th year; m – number of input variables; n – number of years.

As a result of normalization we obtain a matrix of standardized values of input variables $\{z_{ij}\}$.

Then there is a division of input variables into stimulants, the increase of which improves the level of efficiency of the bank, and disincentives, the increase of which worsens the level of efficiency of the bank.

Differentiation of input variables underlies the construction of the reference vector of the studied bank, the coordinates of which for the studied period of time acquire the maximum value for the stimulator, and the minimum value for the destimulator. In this study, all input variables are stimulants.

The distance between the individual elements of the matrix of standardized values of input variables $\{z_{ij}\}$ and a reference vector P_0 of the studied bank in the j -th period is determined by the formula [19, c. 19]:

$$C_{j0} = \sqrt{\sum_{i=1}^m (z_{ij} - z_{0j})^2} \quad (2)$$

The calculation of the integrated taxonomic indicator of bank efficiency (taxonomy ratio) in the j -th period is carried out according to the formula [19, c. 19]:

$$k_j = 1 - d_j, \quad j = \overline{1, n}, \quad (3)$$

$$d_j = \frac{C_{jo}}{\overline{C}_o + 2 \sqrt{\frac{1}{n} \cdot \sum_{j=1}^n (C_{jo} - \overline{C}_o)^2}}, \quad \overline{C}_o = \frac{1}{n} \cdot \sum_{j=1}^n C_{jo}.$$

Recognition of the level of the integrated taxonomic indicator of the bank's efficiency will be carried out on the following scale:

- from 0 to 0.19 - critical level;
- from 0.2 to 0.39 - low level;
- from 0.4 to 0.59 - the average level;
- from 0.6 to 0.79 - high level;
- from 0.8 to 1 - the highest level.

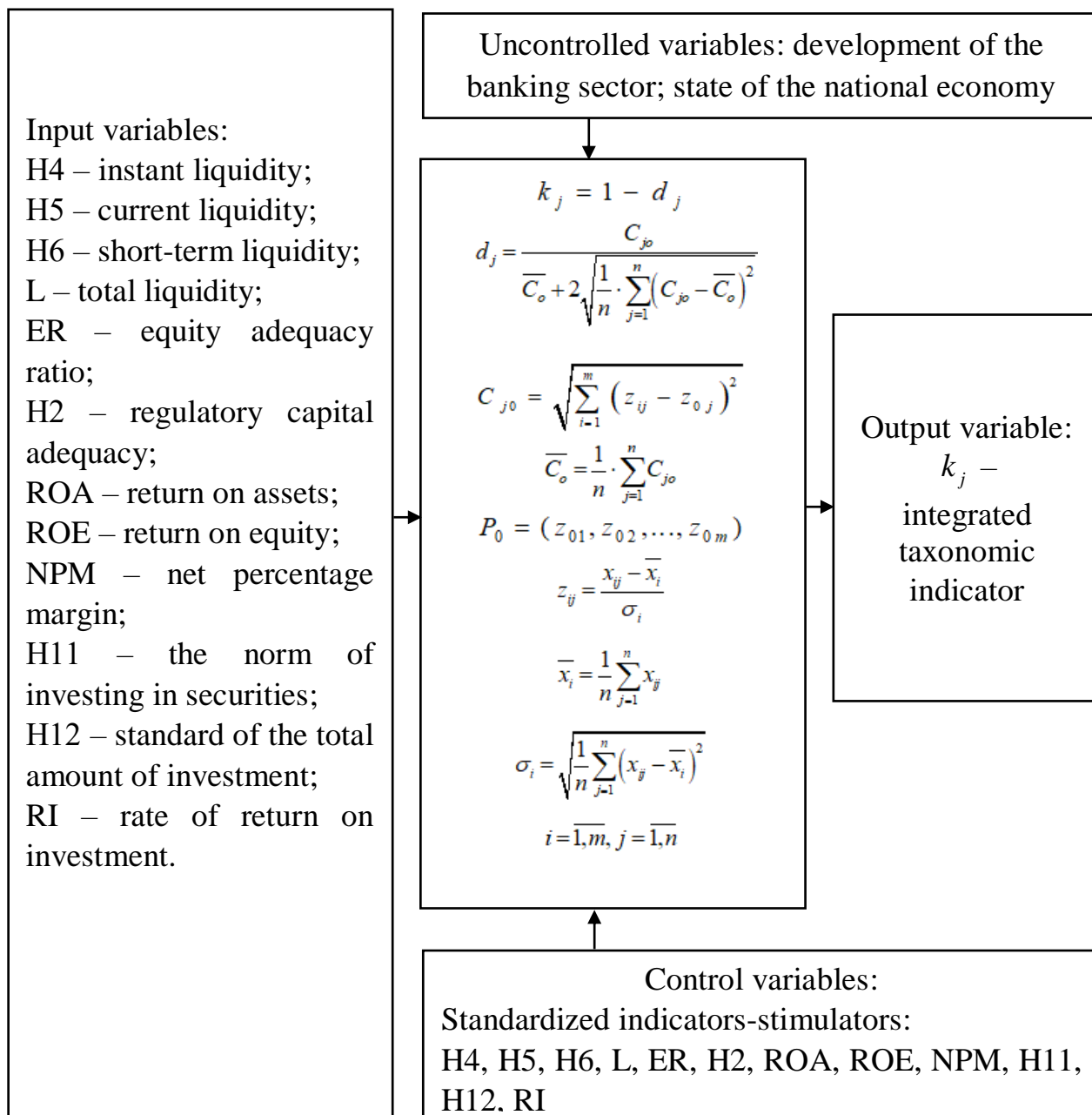


Figure 1.1 Scheme of the description of the structure of the constructed model

SECTION 2. CHECKING THE ADEQUACY OF THE MODEL AND SUGGESTIONS FOR ITS USE

2.1 Study of the bank using the developed model

In this study, the main performance indicators taken from the official reports of Oschadbank [3] for the period 2013 - 2017 were selected for the efficiency of the bank, on the basis of which the above input variables are calculated.

The input data for the construction of an integrated taxonomic indicator of the efficiency of the bank are given in table 2.1.

Table 2.1 - Input data for the construction of a generalized taxonomic indicator of the efficiency of the bank for the period 2013-2017.

Variable	Year				
	2013	2014	2015	2016	2017
x_1	6,75	2,25	4,83	8,57	0,16
x_2	0,97	3,53	0,84	9,33	5,38
x_3	0,10	6,40	6,64	1,19	9,63
x_4	,9	6,8	2,4	,07	5,43
x_5	8,81	5,43	,61	,47	3,36
x_6	5,41	1,4	1,47	0,74	,67
x_7	7,4	8,5	,3	,3	,2
x_8	-	-	4	2	1

	39,6	81,6	,2	,4	,6
x_9	7	6	4	4	3
	,2	,9			
x_{10}	0	0	0	0	0
	,15	,09	,29	,12	,44
x_{11}	0	0	0	0	0
	,43	,25	,425	,41	,195
x_{12}	1	1	0	0	0
	,04	,18		,02	

Source: calculated from data [3].

The coordinates of the reference vector of the studied bank are presented in table 2.2.

Table 2.2 - Coordinates of the reference vector of the studied bank P_o

z_{01}	z_{02}	z_{03}	z_{04}	z_{05}	z_{06}	z_{07}	z_{08}	z_{09}	z_{010}	z_{011}	z_{012}
1,34	1,69	1,55	1,54	1,32	1,5	0,82	0,79	1,37	1,7	0,89	1,34

According to this scale, during the study period the bank had a different level of efficiency (Table 2.3).

Table 2.3 - Dynamics of the integrated taxonomic indicator of the bank's efficiency for the period 2013-2017.

The level of efficiency of the bank	Year				
	2013	2014	2015	2016	2017
Low	0,26		0,22		
Critical		0		0	0

		,13		,06	,09
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Thus, having conducted an integrated assessment of the efficiency of the studied bank for 2013-2017, it should be noted that the level of its efficiency is mainly at low and critical levels.

This indicates inefficient management of the bank. In 2016-2017, the bank has a critical level of efficiency. The explanation for this is the instability of the economic situation in Ukraine.

Instant liquidity, current liquidity and short-term liquidity for all analyzed years corresponded to the allowable level (see Table 2.1). Return on assets and return on equity had a critical level in 2013 and 2014, in other years - an acceptable level. The bank's total liquidity in 2013 and 2016 was critical, in other years it was acceptable.

The capital adequacy ratio in the analyzed period gradually decreased: 2013-2014 - the allowable level, 2015-2017 - the critical level.

Regulatory capital adequacy until 2015 had an acceptable level, and in 2015-2017 it had a critical level. The interest margin until 2016 had an acceptable level, and in 2016-2017 it decreased to a critical level. The norm of investing in securities and the norm of the total amount of investment are characterized by dynamism and scatter of values. The rate of return on investment in 2015 and 2017 was at a critical level.

The obtained values of the integrated taxonomic indicator indicate a low level of efficiency of the studied bank, which may be caused by the difficult economic situation in Ukraine.

The use of taxonomic approach in the management of the bank allows to identify the level of efficiency of the bank, to predict the trend of its change, which, in turn, reduces the degree of untimely response and ineffective management decisions. On this basis, an effective management system of the bank can be built.

2.2 Checking the adequacy of the constructed mathematical model

Before using the developed model to assess the level of efficiency of the bank, it is necessary to check the adequacy.

The analysis of the efficiency of Ukrainian banks gives grounds to claim that in addition to the problems of banks, their efficiency is influenced by the external environment and other indicators. Most existing models for determining the efficiency of the bank do not give the same results in different areas of evaluation. This is because different values can be obtained under different values.

Having conducted an integrated assessment of the efficiency of the studied bank for 2013-2017, it should be noted that the level of its efficiency is at a low and critical levels. If the integrated ratio is critical, it means that some indicators of the bank's performance are also bad. Consequently, the bank is not doing very well.

The adequacy of the model is also evidenced by the results obtained - the best years for Oschadbank were 2013 and 2015, which is characterized by the largest number of the highest values of selected indicators, is the risk of losing the efficiency of the bank was the lowest. The greatest risk is observed in 2016 and 2017, because in this period there is a decline in the values of the analyzed performance indicators of the bank.

CONCLUSIONS

The purpose of the bachelor's thesis was to build a model of an integrated taxonomic indicator of bank efficiency.

First, at the beginning of the analysis of the study was the essence of the concepts of "Banking System", "Efficiency of the bank", its indicators and the problem of efficiency of the bank.

After reviewing the basic information on the efficiency of the bank, the input variables were determined to calculate the integrated taxonomic indicator of the efficiency of the bank and its construction. These indicators reflect the degree of efficiency of the bank's use of own resources.

To assess the effectiveness of the bank, a taxonomic approach was used, the essence of which is to normalize the data, the distribution of indicators on stimulants and distimulators; formation of a reference vector and construction of a generalizing taxonomic indicator. The input variables of these indicators were taken from the reporting for 2013 - 2017.

A separate approach is the division of the obtained indicators by criteria - high, medium, low and critical levels. After conducting an integrated assessment of the efficiency of the studied bank for 2013 - 2017, it was found that the level of efficiency is generally at a low and critical levels. This indicates inefficient management of the bank. This explains the instability of the economic situation in Ukraine.

Instant, current and short-term liquidity for all analyzed years corresponded to the allowable level (Table 2).

Return on assets and return on equity had a critical level in 2013 and 2014, in other years - an acceptable level. The bank's total liquidity in 2013 and 2016 was at a critical level, in other years it was also an acceptable level.

The capital adequacy ratio in the analyzed period fell: 2013 - 2014 - acceptable level, 2015-2017 - critical level.

Regulatory capital adequacy until 2015 had an acceptable level, and in 2015 - 2017 it had a critical level. The interest margin until 2016 had an acceptable level, and in 2016 - 2017 it fell to a critical level. The norm of investing in securities and the norm of the total amount of investment are characterized by dynamism and scatter of values. The rate of return on investment in 2015 and 2017 was at a critical level.

The obtained values of the integrated taxonomic indicator indicate a low level of efficiency of the studied bank, which may be caused by the difficult economic situation in Ukraine. The use of taxonomic approach in the management of the bank allows to identify the level of efficiency of the bank, to predict the trend of its change, which reduces the degree of untimely response and ineffective management decisions.

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Appendix A

	A	B	C	D	E	F	G	H	I	J
1		Кошти на коррахунку	Кошти в касі	Зобов'язання за поточними рахунками	Активи зі строком погашення до 31 дня	Зобов'язання зі строком погашення до 31 дня	Активи зі строком погашення до 1 року	Зобов'язання зі строком погашення до 1 року	Власний капітал	Активи
2										
3	2013	7 651 107	7 624 271	13 503 393	11 192 611	27 309 769	24 176 345	22 593 960	19 204 480	101699201
4	2014	8 022 444	10603119	22 461 392	14 374 159	32 444 566	19 071 192	15 174 468	19237292	124314144
5	2015	17822488	22 799 101	43 597 343	48 559 342	63 421 269	24 381 400	21 678 501	7355960	159095829
6	2016	31204229	41028335	69 486 501	49 024 839	99 386 604	24 130 576	27 480 627	15758755	210638833
7	2017	17081079	28918803	61 253 604	40 440 589	89 056 658	58 119 895	37 564 330	31271807	233872666

Figure A.1 - Comprehensive performance indicators of the bank

Appendix B

	A	B	C	D	E	F	G	H	I	J	K	L	
1		Співність											
2	Рік	Миттєва ліквідність	Поточна ліквідність	Короткострокова ліквідність	Ліквідність банку	Коефіцієнт достатності власного капіталу	Адекватність регулятивного капіталу						
3	2013	113,12	1,416284011	40,98	-0,80097428	107,00	-0,473954901	9,9	-0,902358	18,88	1,3254243	25,41	
4	2014	82,92	-0,780659247	44,30	-0,543667089	125,68	0,366428677	16,8	0,4453196	15,47	0,672192	31,4	
5	2015	93,17	-0,034869046	76,57	1,956874371	112,47	-0,228060273	22,4	1,5390872	4,62	-1,4071823	11,47	
6	2016	103,95	0,749155651	49,33	-0,154303504	87,81	-1,33765953	8,07	-1,259786	7,48	-0,8595485	10,74	
7	2017	75,10	-1,349911369	45,41	-0,457929498	154,72	1,673246028	15,43	0,1777372	13,37	0,2691145	6,67	
8	Середнє	93,65378228		51,31827229		117,5363074		14,52		11,966932		17,138	
9	Стандартне відхилення	13,74634909		12,90224054		22,22306821		5,119918		5,2184629		9,533837423	
10	Умовно-оптимальний рік	113,12	1,42	76,57	1,96	154,72	1,67	22,40	1,54	18,88	1,33	31,40	1,5

Figure B.1 - Calculation of a comprehensive indicator of the efficiency of the bank

	Надійшло				Живучість				Вмотивованість					
	Рентабельність виплатів		Рентабельність власного капіталу		Процентна маржа		Норматив інвестування в цінні папери		Норматив загальної суми інвестування		Строк окупності інвестицій		Норма прибутку на інвестиції	
3	0,86764643	-7,4	-1,084025591	-39,6	-0,50354602	7	1,3697257	0,15	-0,51726786	0,43	0,885955924	15,44	-0,514985	1,04
4	1,495934886	-8,5	-1,356269461	-81,6	-1,747600892	6,2	0,8163012	0,09	-0,98327495	0,25	-0,92622665	13,75	-0,514994	1,18
5	-0,594514019	0,3	0,821681498	4,2	0,79382549	4,9	-0,083014	0,287	0,546781644	0,425	0,83561752	9557,20	-0,459867	0,00
6	-0,671083397	0,3	0,821681498	2,4	0,740508853	4	-0,705616	0,12	-0,7502714	0,41	0,684602305	926,32	-0,509723	0,02
7	-1,097983901	0,2	0,796932055	1,6	0,716812569	3	-1,397397	0,436	1,704032568	0,195	-1,4799491	435329,38	1,999569	0,00
8		-3,02		-22,6		5,02		0,2166		0,342		89168,41989		0,449162
9		4,040495019		33,76056872		1,4455449		0,128753408		0,09932774		173117,7843		0,541434
10	1,50	0,30	0,82	4,20	0,79	7,00	1,37	0,44	1,70	0,43	0,89	13,75	-0,51	1,18

Continuation of Figure B.1