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## COMPREHENSIVE APPROACH TO ASSESSMENT OF EFFECTIVENESS OF CREDIT INVESTMENT BANKING

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*Summary. Methods of statistical analysis of time series have been used for determining a tendency of changes of credit investment bank portfolios and forecasting their values. An integral assessment of efficiency of the credit investment banking has been calculated. Multifactorial correlation and regression analysis has been conducted for determining the degree of impact of banks' resource base on volumes of their credit investment portfolios.*

*Аннотация. Применены методы статистического анализа рядов динамики для выявления тенденции изменения объемов кредитно-инвестиционных портфелей банков и прогнозирования их значений. Рассчитано интегральную*

**Key words:** *efficiency of investments, integral assessment, credit investment portfolio, tendency, bank strategy.*

**Ключові слова:** *ефективність капіталовкладення, інтегральна оцінка, кредитно-інвестиційний портфель, тенденція, стратегія банку.*

**Ключевые слова:** *эффективность капиталовложения, интегральная оценка, кредитно-инвестиционный портфель, тенденция, стратегия банка.*

Banks are the dominant link of the country financial system which supplies the Ukrainian economy with cash resources. At the same time, bank establishments seek to maximize level of effectiveness of the credit investment activities by detecting the key directions of investing. Identifying of optimal ways of investing takes place when a strategy of the credit investment banking is developed and modeled. The need for improvement of a calculation method of effectiveness of the credit investment bank strategy is caused by increasing of price competitiveness and consequences of this process.

*Анотація. Застосовано методи статистичного аналізу рядів динаміки для виявлення тенденції зміни обсягів кредитно-інвестиційних портфелів банків та прогнозування їх значень. Розраховано інтегральну оцінку ефективності кредитно-інвестиційної діяльності банків. Проведено багатофакторний кореляційно-регресійний аналіз ступеня впливу ресурсної бази банків на обсяги їх кредитно-інвестиційних портфелів.*

*оценку эффективности кредитно-инвестиционной деятельности банков. Проведено многофакторный корреляционно-регрессионный анализ степени влияния ресурсной базы банков на объемы их кредитно-инвестиционных портфелей.*

### **Analysis of investigations and publications.**

Theoretical aspects of bank investment management have been investigated deeply by foreign researchers such as: I. Ansoff, M. Porter, D. Strickland, M. Frost and others. Theoretical positions of the credit investment bank strategies formation and practical recommendations for its effective realization have been proposed by domestic scientists and leading specialists in banking such as: B. Lutsiv, T. Mayorova, A. Moroz, I. Parasiy – Verhunencko, L. Prymostka, G. Pyriy and others. Having analyzed lots of scientific publications it has become obvious that development of methods

of the credit investment risks evaluation and bank investments' optimizing must be continued.

**The aim of the article** is to improve a method of calculation of the credit investment bank strategies effectiveness and to identify the priority directions of investing.

**Justification of received scientific results.** The term «a bank strategy» is explained in different ways in scientific resources [1, c. 49]. However, there is a need to complement the list of items on the basis of which the definition of the studied category occurs. Taking into account the results of conducted research of the concept of “a strategy of a bank” and the foundations of the integration approach, we offer following definition of the category: «The credit and investment bank strategy is management of the credit and investment activities, which are aimed at the efficient usage of formed resource base by effective implementation of mechanisms of investments in accordance with the influence of variability of the credit investment climate in a country to achieve the set of goals of a bank activity».

Methodology of formation of strategy of the credit investment banking involves its basic principles formulation. The first principle foresees regularity in international experience implementation of

development and formation of the banking system in Ukrainian conditions. The second principle requires the market economy mechanisms are adapted to domestic economy features under the influence of instability of the financial and banking systems [2, c. 133].

We suggest that strategy of the credit investment banking has to be considered as a part of management of the credit and investment strategies of an institution.

Establishment of an effective system of the strategy bank management allows a bank leadership directs its activity in accordance with the banking market conditions and country economy features.

The Board of a bank and its investors need an objective system of assessment of investments effectiveness made in previous period for making decisions when a credit investment strategy is developed. To this end a complex of economic and mathematical methods is used that allows evaluating different parameters of banking.

We have developed own approach to assessment of effectiveness of the credit investment banking (CIB) based on combining and improving existing methods. The main stages of approach implementation are presented in the table 1.

**Table 1**

*The main stages of implementation of the approach to evaluation of CIB effectiveness*

№	What are the stages of research
1.	Data gathering of quarterly information about chosen banks performance for the latest 5 years
2.	Applying of statistical analysis of time series and forecasting volume of the credit and investment bank portfolio for the next 2 years
3.	Integral index calculation of effectiveness assessment of the credit and investment banking for the latest 4 years
4.	Carrying out correlation and regression analysis of factors having the most significant influence on the credit and investment portfolio's volume
5.	Giving recommendations and making conclusions

Source: Developed by the authors

PJSC “Privatbank” and foreign branch of PJSC “Raiffeisen Bank Aval” and state-owned PJSC “Oschadbank” have been chosen by us to be investigated. Having significant amounts of the credit investment

portfolios all banks are universal at the same time from the point of view of counteragents covering. Dynamics of indicators describing credit investment banking is presented in the tables 2 and 3.

**Table 2**

*Structure of the credit investment banks' portfolios during 2010-2013 on 31 December of each year (UAH in billions)*

Indicator	PJSC «Privatbank»				PJSC «Raiffeisen Bank Aval»				PJSC «Oschadbank»			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
CIP	113,86	128	120,1	147,9	55,15	51,8	33,84	33,31	56,26	73,42	73,24	80,94
Interbank loans	10,06	3,8	4,7	3,5	0,75	0,3	0,24	0,17	0,54	0,61	8,87	5,03

Table 2 (continuation)

Entity loans	81,3	96,7	94,6	118,8	21,5	23,1	16,7	19,24	39,75	54,37	48,88	49,40
Retail loans	20,6	26,2	19,1	23,8	22,4	19,6	9,4	7,8	5,03	4,47	2,31	2,74
Securities	1,9	1,3	1,7	1,8	10,5	8,8	7,5	6,1	10,94	13,97	13,18	23,73

Source: Calculated by the authors based on sources [3, 4, 5, 6].

Table 3

Dynamics of volume of the credit investment banks' portfolios during 2010-2013  
(percentage)

Indicator	PJSC «Privatbank»				PJSC «Raiffeisen Bank Aval»				PJSC «Oschadbank»			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Growth rate of CIP	134,9	112,4	93,83	123,2	104,8	94,01	65,33	98,43	104,5	130,5	99,76	110,51
Growth rate of inter-bank loans	124,2	37,77	123,7	74,47	159,1	42,86	80,00	70,83	-	113,5	1453,1	56,75
Growth rate of commercial loans	136,1	120,6	92,51	125,4	90,11	97,27	61,12	103,60	100,4	131,4	87,00	101,94
Securities growth rate	135,7	68,42	130,8	105,9	308,8	83,81	85,23	81,33	118,4	127,7	94,36	180,00

Source: Calculated by the authors based on the table 2

Volume of CIP of PJSC «Privatbank» demonstrated upward trend. However, there were slight fluctuations during all investigated period. Growing was caused by increasing amount of retail and corporate lending. Securities transactions were conducted in small quantities. Having analyzed CIP of PJSC «Raiffeisen Bank Aval» the downward tendency was detected because securities transactions and all areas of lending were reduced. It was caused by significant reduction of resource base volume. PJSC «Oschadbank» was increasing CIP volume permanently during period of investigation by amounting loan and securities transactions. 2012 year was the exception when CIP decreased to 180 thousand of UAH in comparison with previous year. Securities transactions showed changes' tendency inherent in the cred-

it portfolio in particular and the credit investment portfolio in general. In other words, there was slight reduction in 2012.

To summarize, we can assert that corporate and retail lending had the main priority in PJSC «Privatbank activity». The most significant amount of CIP of PJSC «Raiffeisen Bank Aval» is occupied by corporate lending. However, there is clear tendency towards reduction of the credit investment operations. The dominant direction of PJSC «Oschadbank» investing is corporate lending and securities transactions.

To detect invisible regularities of changes in volume of CIP which are hard to be identified we used statistical analysis methods. These are calculation of moving average and analytical time series leveling.

Table 4

Dynamics' trends of volumes of the credit investment banks' portfolios for 2010-2013  
(UAH in billions)

Indicator	PJSC «Privatbank»				PJSC «Raiffeisen Bank Aval»				PJSC «Oschadbank»			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Actual value of CIP	113,86	128	120,1	147,9	55,15	51,8	33,8	33,3	56,26	73,42	73,24	80,94
Moving average	108,75	120,7	132	142,3	53,2	46,9	39,7	31,5	61,17	67,64	76,3	80,23
Trend equation	$f(t) = 118,9 + 13,324t$				$f(t) = 45,32 - 5,98t$				$f(t) = 67,54 + 7,12t$			
Trend value	105,53	118,9	132,2	145,5	51,3	45,3	39,35	33,4	53,3	60,42	67,54	74,66
Predicted value of volume of CIP for the end of 2014	158,82				27,39				88,89			
Predicted value of volume of CIP for the end of 2015	172,15				21,42				96,01			

Source: Calculated by the authors

Moving average calculation allows assessing of volumes' dynamics of the CIP banks' portfolios with higher accuracy level and provides information about trend.

Growth is inherent in volumes of portfolios of PJSC «Privatbank» and PJSC «Oschadbank». Downward trend is characteristic of the portfolio's volume of PJSC «Raiffeisen Bank Aval». Time series' analytical leveling is the most advanced method of general

trend detection and its features description. Using this method allowed to detect the main regularity of the credit investment banks' portfolios changes and to describe it by using mathematical equation. The results confirmed nature of changes of the credit investment portfolios and enabled prediction of their volumes for the end of 2014 and 2015.

Trend dynamics of the credit investment banks' portfolios is represented in figures 1 – 3:

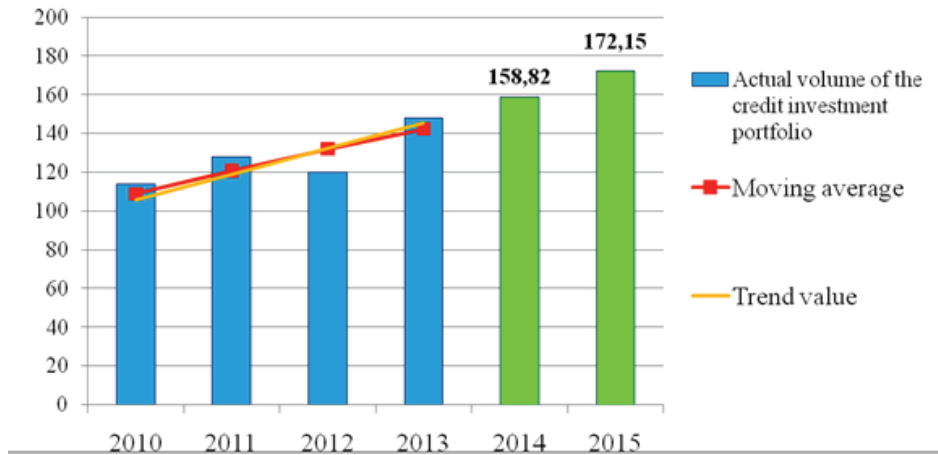


Figure 1. Dynamics of the credit investment portfolio's volume of PJSC «Privatbank» for 2010-2013 (UAH in billions)

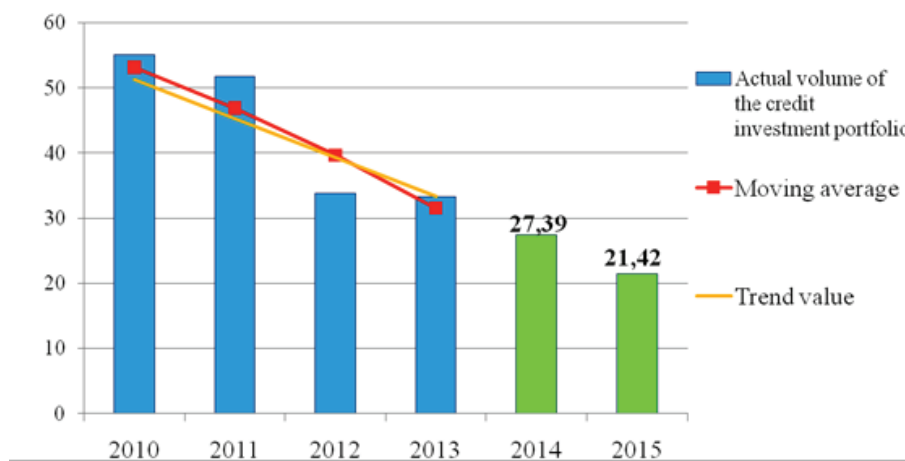


Figure 2. Dynamics of the credit investment portfolio's volume of PJSC «Raiffeisen Bank Aval» for 2010-2013 (UAH in billions)

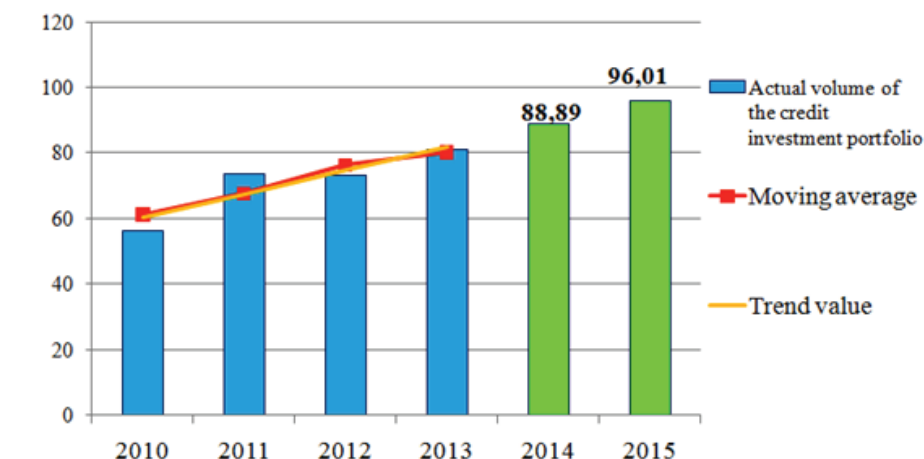


Figure 3. Dynamics of the credit investment portfolio's volume of PJSC «Oschadbank» for 2010-2013 (UAH in billions)

As a basis for assessment of effectiveness of the credit investment operations we used indicators developed by I. M. Parasiy – Verhunencko (table 5) [7]:

Table 5

Indicators of assessment of the credit investment bank operations\*

Group of indicators	Full indicator name	Short name
Profitability of the credit investment operations	Granted loans' profitability	Clp
	The share of revenues of securities transactions in bank income	Ssr
	The share of loan revenues in bank income	Slr
	Coefficient of securities transactions profitability	Cstp
Efficiency	Relationship between interest profit of lending and interest costs of attracted resources	Rco
Income	Coefficient of lending income	Cli
	Coefficient of securities transactions income	Csti
Profitability of assets	Assets' profitability due to loans operations	Capl
	Assets' profitability due to securities transactions	Capst

\*Source: Grouped by the authors based on a source [7]

To be relevant to be used in our complex the index of credit operations' efficiency "Rco" should be calculated the next way. During calculating the interest rate costs must be replaced by the credit resources' price index. It must be calculated such as multiplying of actual average price of the attracted resources and the average volume of the credit operations [8, c. 56]:

$$C_{cr} = A_{rcr} \times \overline{C}_r \tag{1}$$

where  $C_{cr}$  – price of credit resources;  $A_{rcr}$  – the actual average price of the attracted resources;  $\overline{C}_r$  – the average volume of the credit operations.

The interest rates for attracting each type of resources are significantly different. Thus, calculating of the average price of the attracted resources as ratio

of interest expenses for attracting of resources to total volume of the resource base is not correct. We advise to use the formula created by us for calculating the actual average price of the attracted resources:

$$A_{rcr} = \left( \frac{C_i}{S_i} \right) \times w_i + \dots + \left( \frac{C_n}{S_n} \right) \times w_n \tag{2}$$

where  $C_i$  – interest expenses of attracted «i» - type resource;  $S_i$  – volume of attracted «i» - type resource;  $w_i$  – amount of «i» - type resource in total volume of the attracted resources;  $n$  – types of attracted resources.

This formula takes into account the cost of each type of the involved resources.

The final calculation results can be influenced by the fact that the price of resources is high when their

amount is small. To level off consequences of this phenomenon each value of attracted resources has to be multiplied on share coefficient which calculates as amount of «i» - type resource in general volume of attracted resources. If calculation of the price index of the credit resources is objective calculation of volume of the credit operations will be the most accurate.

The ways of calculating indexes of profitability and expenses of attracting resources for securities transactions' conduction are analogical [8, c. 56].

To improve accuracy of assessment of the credit investment banking effectiveness the set of indicators was expanded by implementation of indicators represented in the table 6.

**Table 6**

*Method of calculation of indicators of the credit investment bankin*

Indicator	Method of an indicator calculation
General profitability of the credit investment banking (Cgp)	Ratio between the loan and securities transactions income and the average volume of these operations
Coefficient of relationship between profitability of securities transactions and lending Csti/ Cli	The more securities transactions are conducted effectively in comparison with lending, the nearer indicator's value is at 1. In other words, their profitability is compared.

Source: Developed by the authors.

To select the most effective investment directions and to adopt economically based decisions it is necessary single economical indicators describing credit investment banking are collected into general integral indicator. It is based on calculation of par-

ticular indicators evaluating investments' economical effectiveness and their share detected by experts [9]. Results of calculation of credit investment banking effectiveness are represented in the table 7.

**Table 7**

*Indicators of credit investment banking effectiveness\**

Indicator	Mj	PJSC «Privatbank»						PJSC «Raiffeisen Bank Aval»						PJSC «Oschadbank»					
		Indicator's value				Limit values		Indicator's value				Limit values		Indicator's value				Limit values	
		2010	2011	2012	2013	Max	Min	2010	2011	2012	2013	Max	Min	2010	2011	2012	2013	Max	Min
Clp	0,11	0,16	0,18	0,16	0,15	0,18	0,15	0,18	0,15	0,16	0,17	0,18	0,15	0,14	0,11	0,14	0,15	0,15	0,11
Capl	0,06	0,12	0,14	0,12	0,1	0,14	0,10	0,11	0,09	0,1	0,11	0,11	0,09	0,11	0,09	0,09	0,08	0,11	0,08
Slr	0,03	0,74	0,73	0,75	0,83	0,83	0,73	0,76	0,68	0,69	0,63	0,76	0,63	0,73	0,69	0,67	0,81	0,81	0,67
Rco	0,08	1,78	2,16	2,1	1,65	2,16	1,65	2,88	3,19	3,08	3,17	3,19	2,88	0,7	0,77	0,47	0,68	0,77	0,47
Cli	0,15	0,07	0,1	0,08	0,06	0,1	0,06	0,12	0,1	0,11	0,12	0,12	0,1	0,08	0,06	0,08	0,08	0,08	0,06
Csti / Cli	0,12	-0,76	-0,1	-0,16	0,02	0,02	-0,76	0,13	0,65	0,5	0,44	0,65	0,13	1,07	2,3	-0,36	0,79	2,3	-0,36
Cstp	0,09	0,04	0,07	0,06	0,09	0,09	0,04	0,08	0,11	0,11	0,11	0,11	0,08	0,15	0,19	0,08	0,15	0,19	0,08
Capst	0,05	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,01	0,03	0,04	0,01	0,04	0,04	0,01
Ssr	0,02	0,01	0,01	0,01	0,01	0,01	0,00	0,09	0,15	0,12	0,09	0,15	0,09	0,19	0,28	0,09	0,37	0,37	0,09
Csti	0,14	-0,05	-0,01	-0,01	0,01	0,01	-0,05	0,02	0,07	0,05	0,05	0,07	0,02	0,09	0,14	-0,03	0,06	0,14	-0,03
Cgp	0,17	0,07	0,1	0,08	0,06	0,1	0,06	0,09	0,1	0,1	0,11	0,11	0,09	0,08	0,07	0,06	0,07	0,08	0,06

Source: Calculated by the authors based on sources [3, 4, 5, 6].



Taking into consideration an indicator importance expert who calculates integral assessment of investments effectiveness arranges scores for all indicators which are base for weight coefficients' calculation. To calculate integral assessment we exploited method proposed by V. M. Hobta [9]:

$$Wi = \sqrt[k]{\prod_{j=1}^n U_j^{Mj}}, k = \sum_{j=1}^n Mj \quad (3)$$

where  $Wi$  – integral assessment of «i» - investment project;  $Uj$  – assessment of «j» - indicator of «i» - invest-

ment project;  $Mj$  – weight rating of «i» - indicator of «i» - investment project.

Investor can fast and effectively identify priority areas to invest bank's resources based on calculated results of integral assessment of investments' effectiveness for each possible direction. This approach enables to reflect mostly investor's goals because having option of variation of analyzed indicators' weight ratings.

**Table 8**

*Integral assessment of effectiveness of credit investment banking*

Indicator	PJSC «Privatbank»				PJSC «Raiffeisen Bank Aval»				PJSC «Oschadbank»			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Clp	1,45	2,00	1,42	1,00	2,00	1,00	1,41	1,87	1,91	1,00	1,92	2,00
Capl	1,60	2,00	1,56	1,00	1,94	1,00	1,31	2,00	2,00	1,24	1,11	1,00
Slr	1,04	1,00	1,15	2,00	2,00	1,35	1,46	1,00	1,43	1,12	1,00	2,00
Rco	1,25	2,00	1,87	1,00	1,00	2,00	1,63	1,92	1,77	2,00	1,00	1,72
Cli	1,33	2,00	1,67	1,00	1,79	1,00	1,31	2,00	2,00	1,00	1,87	1,77
Csti / Cli	1,00	1,85	1,77	2,00	1,00	2,00	1,71	1,59	1,54	2,00	1,00	1,43
Cstp	1,00	1,69	1,49	2,00	1,00	2,00	1,80	1,81	1,64	2,00	1,00	1,58
Capst	1,16	2,00	1,00	1,56	1,00	2,00	1,43	1,14	1,64	1,96	1,00	2,00
Ssr	1,12	1,59	1,00	2,00	1,03	2,00	1,49	1,00	1,35	1,68	1,00	2,00
Csti	1,00	1,80	1,73	2,00	1,00	2,00	1,75	1,71	1,70	2,00	1,00	1,54
Cgp	1,29	2,00	1,68	1,00	1,00	1,17	1,37	2,00	2,00	1,66	1,00	1,56
Integral assessment	1,20	1,88	1,58	1,34	1,25	1,45	1,51	1,76	1,79	1,54	1,19	1,62

Source: calculated by the authors.

To identify coefficients having sharp fluctuations and significant impact on integral assessment value we implemented graphical analysis method. Obtained results had positive influence on increasing of conclusions and prepositions objectiveness.

Graphical comparison of values of investigated indicators during maximal and minimal effectiveness level of the credit investment activities of investigated banks presented on the figures 4 - 6.

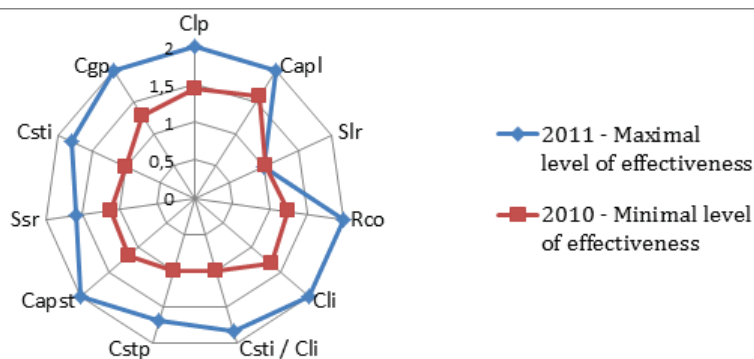


Figure 4. Comparative diagram of maximal and minimal levels of effectiveness of the credit investment banking of PJSC «Privatbank»

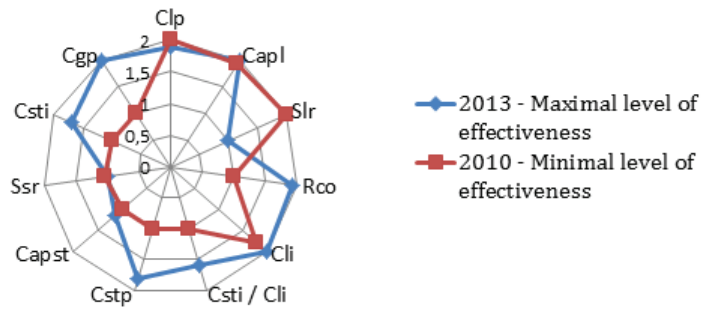


Figure 5. Comparative diagram of maximal and minimal levels of effectiveness of the credit investment banking of PJSC «Raiffeisen Bank Aval»

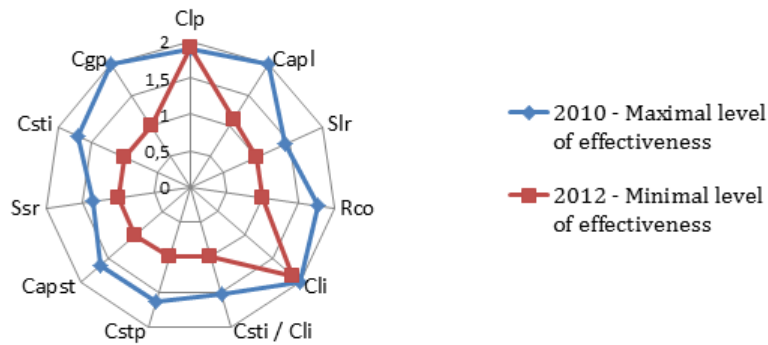


Figure 6. Comparative diagram of maximal and minimal levels of effectiveness of the credit investment banking of PJSC «Oschadbank»

Table 8 and figure 5 are the evidence that strategy of PJSC «Privatbank» was the most effective in 2011. It was caused by maximal values of almost all investigated indicators. That in turn, was as a result of high level of lending profitability. Costs of attracted resources for conducting securities transactions were higher than level of their income. This phenomenon resulted in losses during all period of investigation. However, their values were close to zero in 2011.

The maximal level of effectiveness of the credit investment banking of PJSC «Raiffeisen Bank Aval» was observed in 2013. This phenomenon was due to higher average values of almost all indicators.

High level of profitability of the credit investment operations was as a result of low interest expenses for resource base formation.

In 2010 credit investment activities of PJSC «Oschadbank» was the most effective due to all investigated indicators except «Ssr» and «Slr» had satisfactory values.

Correlation analysis was conducted to identify factors having the most significant influence on the credit investment banks' activities. Volume of the credit investment portfolio was chosen as the key indicator. Indicators characterizing resource base volume were chosen as potential factors of influence.

**Table 9**

Level of impact of factor characteristics on volumes of the credit investment banks' portfolios for 2011-2013\*

Bank	Equity (X1)	Authorized capital (X2)	Deposits		Financial result (X5)	Liabilities (X6)
			Retail (X3)	Corporate (X4)		
PJSC «Raiffeisen Bank Aval»	0,76	0,71	0,87	0,731	0,71	0,939
PJSC «Privatbank»	0,88	0,79	0,989	0,261	0,75	0,913
PJSC «Oschadbank»	0,93	0,89	0,85	0,78	0,79	0,94

\*Source: Calculated by the authors.



Volumes of the credit investment portfolios depend mostly from retail deposits than corporate deposits. It is due to significant amount of householders' funds. There is clear correlation among volumes of CIP, equity and bank liabilities.

In order to conduct quantitative assessment of resource base impact on volumes of the credit invest-

ment banks' portfolios multivariate correlation regression analysis was conducted based on correlation analysis results. Volume of CIP was chosen as the resulting indicator (Y). The main influencing factors for PJSC «Privatbank» and PJSC «Oschadbank» were X1, X2, X3, X4, X5, X6 and X3, X6 for PJSC «Raiffeisen Bank Aval».

**Table 10**

*Modeling dependence of volumes of the credit investment portfolios from factor characteristics*

Regression model	Coefficient of correlation R	Coefficient of determination R <sup>2</sup>	Value of «F» - indicator
PJSC «Privatbank»			
$Y = 32,3 -$	0,88	0,77	0,12743
PJSC «Raiffeisen Bank Aval»			
$Y = -$	0,93	0,88	0,11422
PJSC «Oschadbank»			
$Y = 25,7 + 1,57 \times X1 + 1,05 \times X2 + 2,93 \times X3 + 1,93 \times X4 + 2,1 \times X5 -$	0,95	0,91	0,09382

*\*Source: Calculated by the authors.*

Having conducted multivariate correlation regression analysis we can assert that volume of CIP of PJSC «Privatbank» is mostly influenced by volume of the capital and retail deposits. Level of model's accuracy is 77 %. Volume of CIP of PJSC «Raiffeisen Bank Aval» depends on households' deposits and bank liabilities' volume. Level of model's accuracy is 88 %. Volumes of the credit investment operations of PJSC «Oschadbank» correlate with bank's capital and attracted retail deposits. Impact of householders' deposits is mutual for all investigated banks.

**Conclusions.** It has become possible to make conclusions with higher accuracy level after proposed method is realized. Specifically, taking into consideration that securities transactions of PJSC «Privatbank» were in red the priority directions of its activity have to be corporate and retail lending. Changes in composition of securities portfolio also are required. To ensure the growth of CIP it is necessary to

enlarge volume of equity and householders' deposits. It will be advisable for PJSC «Raiffeisen Bank Aval» to continue investing in securities and granting loans to corporate sector. Taking into account the fact conducting securities transactions is less profitable than lending their amount has to be no more than 30 – 35% of granted loans' volume. To amount volume of CIP we recommend to expand volumes of liabilities and retail deposits. If composition of securities transactions' portfolio of PJSC «Oschadbank» is corrected in accordance with its structure during 2010-2011 effectiveness of investment activity will improve rapidly. Taking into consideration that level of profitability of the credit and investment operations is the same relationship between their volumes has to be set up in accordance with riskiness of their realization. To increase volume of a bank CIP it is necessary to enlarge volumes of bank capital and retail deposits.

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