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Econometary Analysis of Factors Affecting Loaning Processes of Commercial Banks

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Abstract: *This article provides an econometric analysis of lending operations, one of the main active operations of Alokabank and Agrobank, and the factors affecting its practical condition. A correlation matrix on the factors influencing the lending practice of banks has been developed, and based on the results of the regression, problems have been identified and practical suggestions and recommendations have been made.*

Keywords: *Loan portfolio, credit risk, diversification, bank assets, interest rates, problem loans, reserves, network limits, credit mechanism, cost-effectiveness, income.*

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Introduction

Reforms in the banking system of the country in recent years are aimed at fulfilling the tasks set out in the regulations on the development of the financial and banking system, and as a result, there is a high growth trend of bank assets and loans.At the same time, the ongoing reforms in the banking system of the country are aimed at further simplifying lending practices, increasing their economic efficiency and optimizing interest rates, increasing the role and participation of banks in the socio-economic development of Uzbekistan in accordance with the Action Strategy. "... which will serve to improve the competitive environment in the industry, to improve the activities of commercial banks, the quality and culture of lending in all respects (Petition, 2019)".

The organization, implementation and control and monitoring of lending operations is a complex multi-stage process. Effective lending in banks is based primarily on an in-depth analysis of the factors affecting lending.

Assessing and regulating the risk of the loan portfolio as one of the main directions of effective management of the bank's credit activity is the most important issue for the bank, allowing the least risk and ensuring maximum profitability - the main goal of the loan portfolio management process.

Literature review

Theoretical and practical aspects of the organization of lending practices in commercial banks, the factors influencing it and their econometric analysis, the development of lending activities have been studied by a number of economists. In particular, according to Lavrushin (2006), an effective system of lending is a guarantee of successful development of production and socio-economic processes in general.

Mc.Naughton (1993) concluded in his research that one of the necessary conditions for the organization and regulation of lending practices of commercial banks and increase its efficiency is the adoption of collateral loans in developing countries.

According to Yudina's (2013) scientific conclusion, rational risk diversification in developing countries is a prerequisite and necessary condition for the development of commercial bank lending practices.

According to Abdullaeva (2017), an economist in Uzbekistan, credit operations of commercial banks are the process of lending a certain amount of money (or goods) on certain terms, ie on terms of repayment, maturity, repayment.

According to Azizov, Karaliev (2016), the organization of lending involves the harmonization of mutual obligations and interests of two subjects of credit relations - the bank (lender) and the client (borrower).The completeness of credit operations by commercial banks depends on the extent to which their credit policy is structured.

Research methodology

The main purpose of the study is to draw scientific conclusions for the development of scientific and practical proposals and recommendations based on the econometric analysis of factors affecting the lending practices of commercial banks. The theoretical and methodological basis of this article is the analysis of general economic literature and scientific articles, research of economists on the factors influencing the lending activities of commercial banks, conclusions, suggestions and recommendations based on a systematic approach. In the course of studying the topic, the financial data of Alokabank and Agrobank were described in the descriptive statistics, a correlation matrix was constructed, and an empirical model was created based on the regression results. The article also used methods of random and constant effects, the method of summation squares, Pausson probability methods, robust standard errors, and several marginal observations.

Analysis and discussion of results

During the analysis, Aloqabank's activities were studied as an econometric analysis based on quarterly statistics for the period from 2013 to 2020.In doing so, the internal factors influencing Alokabank's loan allocations were analyzed. For the analysis, the amount of loans allocated on a quarterly basis, the volume of problem loans, the amount of attracted deposits, bank capital, average interest rates on loans and deposits were obtained. All statistics provided in national currency were expressed as a ratio of total assets.

Table 1.

Image statistics[1]

Variables	Number of observations	Average	Std.chet.	Min	Max
kt	25	0.711916	0.075641	0.499308	0.812447
pt	25	0.002612	0.002884	0.000000	0.013428
dt	25	0.571612	0.076224	0.433884	0.714592
xt	25	0.160294	0.027227	0.095319	0.220653
kpt	25	0.145599	0.008690	0.130900	0.158253
dpt	25	0.032081	0.020542	0.006900	0.089837

According to the data, the share of credit in assets during the analysis averaged 72 percent, while the minimum and maximum amounts were around 50 percent and 83 percent, respectively.The share of non-performing loans in total assets averaged 0.4 percent, while the minimum and maximum amounts were 0 and 1.5 percent, respectively.The average share of deposits in total liabilities (assets) during the analysis period was 58%, while the share in the analysis period fluctuated between 42% and 72%.While the average share of capital in assets was 16 percent, it fluctuated between 9.4 percent and 23 percent.The average interest rate on loans did not fluctuate significantly during the analysis period and averaged 14.6 percent.The interest rate on deposits, on the other hand, averaged around 3 percent with high volatility (Table 1).

There is a high positive correlation between loan and deposit interest rates.It can also be seen from the table data that there is a high level of positive correlation between bank capital and loans. While there is an inverse correlation between allocated loans and attracted deposits, there is a positive strong correlation with the deposit interest rate.It can also be observed that the correlation between the allocated loans and the average loan interest rate is weak, although positive. The correlation between the attracted deposits and the average interest rate on average deposits can be observed to be positive and relatively strong (Table 2).

Table 2.

Correlation matrix[2]

	kt	pt	dt	xt	kpt	dpt
kt	1.00					
pt	0.20	1.00				
dt	-0.28	-0.45	1.00			
xt	0.59	0.09	-0.28	1.00		
kpt	0.23	-0.05	0.12	0.61	1.00	
dpt	0.45	-0.17	0.57	0.32	0.54	1.00

All variables are stationary in the first degree difference, and all variables in the zero degree difference have a nonstationary appearance.However, due to the low number of observations, regression was achieved in both cases. All variables are stationary in the first degree difference,

[1]Formed by the author.
[2]Formed by the author.

and all variables in the zero degree difference have a nonstationary appearance.However, due to the low number of observations, regression was achieved in both cases. The following table presents the regression results (Table 3).

Table 3.

Unit root test results[3]

Variables	Dickey-Fuller test	Conclusion	Variables	Dickey-Fuller test	Conclusion
kt	-1.877	I(1)	Δkt	-4.841	I(0)
pt	-2.944	I(1)	Δpt	-5.951	I(0)
dt	-1.226	I(1)	Δdt	-5.130	I(0)
xt	-2.426	I(1)	Δxt	-6.295	I(0)
kpt	-0.833	I(1)	Δkpt	-3.715	I(0)
dpt	1.077	I(1)	Δdpt	-4.902	I(0)

According to the results of the first model above, the bank's equity remains the main tool for determining the volume of bank loans. However, this model has an autocorrelation problem, which can be observed from the results of two tests.In the second model, when we solve the problem of auto-correlation, the volume of credit, as well as bank capital, is the main criterion in the allocation of credit by the bank. In both of these models, the non-stationary nature of the variables is somewhat questionable. Therefore, in the third model, the variables were stationary and regression was performed.

According to the results of the regression, changes in bank capital play a key role in changes in loan volume. According to the results of the autocorrelation test of the third model, there is no autocorrelation problem in this model. We can also observe that, based on the results of all models, other variables have no effect on credit volume fluctuations.In conclusion, the main part of Alokabank's loan portfolio in terms of currencies is 65% of loans to corporate clients in national currency, 20% of retail loans to retail customers in national currency, and 18% to corporate clients in foreign currency.If we look at the structure of the bank's assets, in 2020, 82% of the bank's assets will be bank loans. This can be considered as a positive situation in terms of the bank's profitability. However, in terms of the bank's liquidity, loans account for more than 80% of assets[4].

We also conducted an econometric analysis of the factors affecting the loans provided by Agrobank, one of the largest joint-stock commercial banks in the Republic of Uzbekistan. Agrobank's statistics were analyzed by sectors of the economy, as well as by the form of ownership of entities in these sectors.In general, econometric analysis was conducted on the basis of sectors of the economy and economic entities. The data are presented in terms of years, sectors of the economy, as well as the form of ownership, i.e., panel data. In pictorial statistics, statistics are balanced panels.

[3]Formed by the author.
[4]Source: https://www.aloqabank.uz/ - information from the official website.

Table 5.

Image statistics[5]

Tracking	Variables	Average	Std.chet.	Min.	Max
$credit_{ijt}$	354	0.0197740	0.0528663	0	0.42974
$deposit_{ijt}$	354	0.0000310	0.0002066	0	0.00270
$vehicle_{ijt}$	354	0.0039291	0.0159287	0	0.15993
$inventory_{ijt}$	354	0.0000571	0.0002955	0	0.00364
$property_{ijt}$	354	0.0041759	0.0112390	0	0.07139
$equipment_{ijt}$	354	0.0003474	0.0014307	0	0.01147
$third\_p\_g_{ijt}$	354	0.0019532	0.0124543	0	0.15828
$third\_p\_w_{ijt}$	354	0.0061351	0.0197721	0	0.17337
$insurrance_{ijt}$	354	0.0016712	0.0122578	0	0.12935
$others_{ijt}$	354	0.0013165	0.0111699	0	0.15654
$average\_rate_{ijt}$	354	0.0502200	0.0661523	0	0.16920

In the descriptive statistics of the variables, all the variables, except the average interest rate, are presented in the form of the ratio of the total loans allocated in the corresponding year. Since the standard deviation of all variables is larger than the average, and the maximum value of the variables is several times higher than the average, it can be concluded that there are marginal observations in the observations. This in turn means that this problem must be taken into account when performing regression analysis. It also means that the allocated loans, as well as the variables that affect the allocation of loans, are unevenly distributed across sectors of the economy and the form of ownership of the entities. For example, the maximum value of loans disbursed during the analysis period is 21 times higher than the average amount of loans disbursed during the analysis period, which in turn means that the bank does not pay enough attention to diversifying its loan portfolio. (Table 5).

The main goal of loan portfolio diversification is to reduce risk and increase profitability by operating in several areas.Rational diversification also increases the universality and independence of banks, as the level of dependence on banking, industry or customer decreases.This provides an opportunity to cover losses from one sector with income from another and does not significantly affect the bank's operations or financial condition.

Diversification of borrowers is done by distributing loans among different categories of the population depending on the purpose of lending.Diversification of the loan portfolio in relation to business entities is carried out between large and small companies, small businesses, public and private organizations, and so on. At the same time, the bank seeks to diversify its loan portfolio by placing more moderate loans.

Diversification of the loan portfolio by maturity is of particular importance, as the level of bank credit risk usually increases as the loan term matures. Diversification of collateral for loans will allow to optimally cover credit losses at the expense of the borrower's property. Sectoral diversification involves the distribution of loans among customers operating in different sectors of the economy.

[5]Formed by the author.

Table 6.

Correlation matrix[6]

	$credit_{ijt}$	$deposit_{ijt}$	$vehicle_{ijt}$	$inventory_{ijt}$	$property_{ijt}$	$equipment_{ijt}$	$third\_p\_g_{ijt}$	$third\_p\_w_{ijt}$	$insurrance_{ijt}$	$others_{ijt}$	$average\_rate_{ijt}$
$credit_{ijt}$	1.00										
$deposit_{ijt}$	0.17	1.00									
$vehicle_{ijt}$	0.84	0.10	1.00								
$inventory_{ijt}$	0.33	0.01	0.11	1.00							
$property_{ijt}$	0.67	0.27	0.46	0.29	1.00						
$equipment_{ijt}$	0.49	0.28	0.12	0.45	0.60	1.00					
$third\_p\_g_{ijt}$	0.44	0.10	0.33	0.11	0.14	0.38	1.00				
$third\_p\_w_{ijt}$	0.58	0.06	0.18	0.46	0.40	0.48	0.05	1.00			
$insurrance_{ijt}$	0.57	0.01	0.55	0.02	0.27	0.02	0.02	0.27	1.00		
$others_{ijt}$	0.63	0.09	0.78	0.09	0.27	0.11	0.43	0.02	0.08	1.00	
$average\_rate_{ijt}$	0.28	0.18	0.14	0.20	0.29	0.20	0.17	0.27	0.09	0.04	1.00

The correlation of the independent variables is not high, which in turn means that the problem of multicollinearity does not arise in our regression analysis. Also, the correlation of independent variables with the dependent variable has a positive sign in all cases, which means that all independent variables have a positive relationship with the dependent variable.The highest rate of positive correlation is for vehicles, while the lowest correlation is for deposits. It also shows that the positive correlation between interest rates and allocated loans is also weak. (Table 6).
The empirical model is written in the following view:

$$credit_{ijt} = \alpha + \beta^n * X^n{}_{ijt} + Y_i I_i + \mu_{ij} + \mathcal{E}_{ijt} \qquad (1)$$

$i = \{1,2,...,8\}$; $j = \{1,2,...,11\}$; $t = \{2013,2012,...,2020\}$; $n = \{1,2,...,10\}$

As we can see in the above diagrams and pictorial statistics, there are several marginal observations in the statistical observations, which in turn implies the existence of a heteroskedasticity problem in the standard deviation of the residues and the use of a robust standard error in regression. Therefore, standard errors in estimating regression results were calculated in a robust manner.

[6]Formed by the author.

The coefficients of the variables in the model given in Equation (1) are econometrically evaluated using the methods of random and variable effects. In addition, the model assembly is also econometrically evaluated using the smallest squares method.Although the results of the smallest squares method of aggregation produce incorrect coefficient values when evaluating our panel data, it may be useful to check the consistency in the results. However, these do not completely solve the problems associated with statistics, i.e. the problem of many zeros and non-negative values. The Pausson probability method was used to solve these problems.

We have presented the results of the empirical model calculated in 4 different regression models. According to the results of the regression, deposits, vehicles, real estate, third-party guarantees and sureties have a positive impact on the allocation of credit according to all model assessments.These positive effects are of high economic and statistical significance in all models. The average interest rate [1], [2], [3] is not statistically significant according to the model results. However, according to the results of the model [4], which more fully reflects the nature of statistical data, it has both economic and statistical significance.The direction of the impact of the interest rate is positive and is consistent with economic theory. That is, the bank, as a commercial organization, prefers to provide loans at high interest rates. In addition to variables, the models also include fictitious variables, the results of which in the model [4] also played an important role in the allocation of credit, depending on which sector of the economy the subjects to which the loan was allocated. According to the analysis of coefficients, loans were allocated mainly to economic entities operating in agriculture, trade and other sectors. This in itself means that the bank's loan portfolio is not sufficiently diversified, and that the bank is still operating as a specialized bank.

Conclusions and suggestions.

As a result of econometric analysis of credit data and factors influencing lending practices of the largest commercial banks in the country, including Alokabank and Agrobank, the following, generalized conclusions have been formed:

- the analysis revealed that the level of diversification of credit investments of commercial banks is low;
- that the positive correlation between interest rates and allocated loans is weak;
- that the mutual correlation of the independent variables according to the correlation matrix is not high;
- it was found that the bank rarely uses modern methods to prevent and reduce credit risk.

Here are some suggestions for improving the lending practices of commercial banks:

- banks should ensure the optimal level of diversification of the loan portfolio by setting and strictly adhering to the limit of loans issued by commercial banks to one industry and one industry on the basis of advanced foreign experience;
- it is expedient to increase the level of diversification of the bank's loan portfolio by increasing the amount of retail loans to individuals;
- it is necessary to create an effective system of credit risk management in banks based on modern mechanisms.

We believe that the implementation of these proposals in practice will help to improve the practice of lending in commercial banks, to identify the factors influencing it, credit risk management and improve the quality of the bank's loan portfolio.

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