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ECONOMETRIC ANALYSIS OF FACTORS AFFECTING THE QUALITY OF BANKS' ASSETS

M. Kh. Takhirov

Abstract

In the world, special attention is paid to scientific works aimed at improving the quality of bank assets, improving the system of its effective management and their support. In the improvement of the bank's lending activities, the bank allocates loans to the extent of the borrower's participation in the loaned investment projects, financing them with their own funds or other sources equivalent to them, the income received from investments in issuers' debt securities, as well as repo agreements, and determining its rate when financing according to the term of the investment scientific research is being conducted on the issues.

Factors affecting the quality of bank assets and their econometric analysis are scientifically justified in the article.

Keywords:
bank asset quality, multifactor linear regression, multicollinearity, autocorrelation, homoscedasticity, coefficient of determination, econometric software.

Author correspondence:
M. Kh. Takhirov
Independent researcher,Tashkent Institute of Finance, Tashkent, Uzbekistan
E-mail: m_kh_takhirov@gamil.com

INTRODUCTION

Ensuring the stability of the banking system in Uzbekistan, improving the financial condition of the bank by increasing the quality of assets, increasing the bank's dividends as a result of improving the loan portfolio, lending to the leading sectors of the economy and individuals are among the urgent issues. To ensure the implementation of this task, to take measures to improve the loan portfolio of banks, to prevent risks and to reduce their negative effects, to ensure the level of stable growth of loans, to introduce modern corporate management into banking practice, to substantiate proposals and recommendations aimed at strengthening measures to further improve the quality of bank assets , improving the efficiency of banks' loan and investment portfolio is one of the current issues.

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LITERATURE REVIEW

The quality of bank assets is important in the operation of banks. Because the quality of assets directly depends on the bank's financial results and helps determine the bank's profitability.

A. Smith states that "the existence of the division of labor in the economy serves as the basis for increasing the efficiency of bank assets and effectively organizing the activities of financial institutions in general." According to A. Smith, "... division of labor in society is such an economic mechanism that binds people together based on their mutual interest, which provides an opportunity to exchange financial and material resources between them. This mechanism is the market." The author approaches the quality of bank assets from a classical point of view, he considers the division of labor to be primary to improve the quality of bank assets.[1]

Y. Schumpeter points out that "banks are not ordinary financial institutions that turn savings into investments, but they are active creators of economic development." Indeed, commercial banks are organizations with enormous financial potential. The role of commercial banks is invaluable in terms of providing the economy with financial resources, making settlements between suppliers and buyers, regulating the money supply, and other situations.[2]

of O.I. Lavrushin to his opinion according to " commercial of banks liquid assets including cash register cash money , commerce of the bank Central "Nostro" representative office in the bank of the account number balance , commercial of the bank another "Nostro" representation in banks of accounts the remains and on the road money will take **.** We believe that this interpretation is not sufficient to disclose or illuminate the assets of commercial banks. In addition, high liquid assets include trade, banks' foreign currency funds, precious metals, government securities, and securities issued by international financial institutions.[3]

According to Professor Berdiyarov, "any bank faces certain problems in effectively forming the composition of its assets. The quality of bank assets primarily depends on the purposeful structure of assets, liquidity, diversification of asset operations, level of riskiness of assets, weight of problem assets and volatility qualities of assets [1]. According to the author, bank assets and their types and quality have been fully discussed.[4]

[1]Berdiyarov B.T. Issues of ensuring liquidity and solvency of commercial banks of the Republic of Uzbekistan. Dis . ... i.f.d. _ - T. 2019 .

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ANALYSIS AND RESULTS

The econometric analysis of the factors affecting the balance of loans allocated by the commercial banks of our country is carried out by determining the correlation of factors and creating a regression equation. Regression analysis allows the value of the dependent variable to be predicted using the independent variables. For this, monthly data on the following 17 indicators covering the period up to 2020-2022 of the studied object of the Republican banking system were obtained according to Table 1:

Total assets in the cross-section of the studied periods;
Total allocated loans during the studied periods;
The balance of depositors' deposits in the period under study;
In the section of the studied periods, the authorized capital of the bank;
Interest income of the bank during the studied periods;
Interest expenses of the bank during the studied periods;
Non-interest income of the bank during the studied periods;
Interest-free expenses of the bank during the studied periods;
Operating expenses of the bank during the studied periods;
Interest-free profit (loss) of the bank during the studied periods;
Net profit (loss) of the bank during the studied periods;
Problem loans within the bank's loans;
Deposits in national currency;
Loans provided by other banks for the bank;
Balance of loans received from commercial banks;
Interest rates on loans in national currency;
Interest rates on foreign currency loans;

Regression analysis is a tool for determining the value of one variable based on another. Regression is divided into simple linear and multivariate regression. Paired (ordinary) linear regression gives us rules that determine the regression line that best predicts the most likely values of one variable based on another (only two variables). Multivariate regression is an extension of simple linear regression.

The Y-axis is the variable to be predicted (dependent), and the X-axis is the variable to be predicted (independent). A dependent variable is a variable in a regression that cannot be changed, its change is the result of the influence of the independent variable(s). An independent variable is a variable in a regression that can be changed.

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Regression coefficients (b) are coefficients calculated as a result of regression analysis . Values are calculated for each independent variable that represent the strength and type of relationship between the independent variable and the dependent variable.

There are many types of regression analysis, but we construct a regression equation using multivariate linear regression analysis. In this case, the following assumptions should be accepted and fulfilled:

1. The model variables should have a close to normal distribution.

2. Dependent and independent variables should be measured on a metric scale.

3. To construct linear regressions, the dependent and independent variables must have a linear relationship.

4. Absence of multicollinearity - independence of predictor variables, absence of high correlation (for multiple regression). The solution is to remove highly correlated variables from the analysis or to center the data (subtract the means from each observation for the desired variable).

5. Absence of autocorrelation - absence of independence of residuals. The interpretation of the results determined using the Darbin-Watson test (determines first-order autocorrelation) is as follows:

– if d=0 – overall positive autocorrelation ;

– if d = 4 – complete negative autocorrelation ;

– if d = 2 – there is no autocorrelation.

6. Homoscedasticity - the variance of the residuals is the same for each value. Determined using a distribution graph.

Before testing the regression analysis for the aforementioned conditions, we perform multivariate regression. In this case, we will have the following table information. Multivariate regression is an extension of simple linear regression. Simple regression is used to estimate the degree of influence of one independent variable on the dependent variable. Unlike simple regression (Y=B*X+A), multivariate regression examines the effect of two or more independent predictors on the dependent variable (Y=B1*X1+B2*X2+B3*X3+…+A).

Multivariate regression allows us to answer questions about how close the predictive equation is to the data, whether there is a significant linear relationship, and what the estimated coefficient values are for the best predictive equation. In addition, the relative importance of the independent variables in predicting the dependent variable can be determined.

Table 1

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Statistical information about the results [b]

Model	R	R-squared	Adjusted R-squared	Standard error	Darbin-Watson
1	1,000 [a]	1,000	1,000	64.77181	2,637

a. Independent variables: (constant), Bank loans, National currency loan interest rate, National currency loan interest rate, Net profit, Non-performing loans, Interest-free profit, Deposits in national currency, Capital, Interest expense , Deposits, Bank loans, Non-interest expense, Assets, Operating expense, Interest income

b. Dependent variable: Loans

The coefficient of determination, R-squared, shows what proportion (expressed as a percentage) of the variability of the dependent variable (Y) is explained by the independent variable (regression model). The quality of the regression equation means the degree of closeness (correspondence) of the outcome attribute f(x) to the actual (observed) values of Y calculated by this equation. The closer the R-squared is to 1, the better the quality of the regression model. According to the table, according to our analysis, this indicator is equal to 1, which means that the independent variables fully explain the dependent variable. However, the R squared factor is generally superior. To correct this error, we refer to the corrected R-squared. Here too, the positive result we expect is reflected, the value is equal to 1. We say that the general conclusion on the coefficient of determination is positive.

Another indicator that evaluates the quality of the model is the standard error indicator in the table. Interpreted similarly to the standard deviation, it measures how many units, on average, the dependent variable deviates from the independent variable. Its value is used in comparative analysis with other models, and whichever model has a lower standard error, this model is considered to be of good quality. In our case, this indicator was equal to a relatively high value, namely 64.77181.

The autocorrelation index is equal to 2.637 in the results obtained by the Darbin-Watson test. Autocorrelation is considered absent if this result is determined between 1.5 and 2.5 values.

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Table 2

Statistics on the results of ANOVA [a b]

Model		Sum of squares	Mean square	F	r is the value
1	Regression	80532965226,669	5368864348,445	1279706,312	,000 [p]
	The rest	83907,758	4195,388		
	Total	80533049134,427			
a. Independent variables: (constant), and 17 independent factors					
b. Dependent variable: Loans					

Subsequent statistical results help to draw more serious conclusions about the modeling. In this case, the hypothesis that R square is equal to zero is evaluated. According to the table, model quality and statistical significance are measured by r-value. In this case, the value of this indicator is required not to exceed 0.05 (95% accuracy level). In our example, this value is approximately 0.000, which is considered positive.

The interpretation of the results of the general statistical analysis obtained by our model in Gal will be related to the coefficients. We evaluate this by understanding the values of the table below. According to the table, the betas of the independent factors that explain the dependent factor are determined, that is, the influence weight. These betas are calculated separately for standardized and unstandardized correlations.

The standard error value helps in determining the t-statistic, which is the ratio of the unstandardized beta value to the standard error value of the t-statistic. By comparing the t statistic with the critical value, the r value is determined. The value of standardized betas, represented by z-scores with a mean of zero and a standard deviation of 1, makes it possible to compare them and estimate the strength of the effect. The R value indicates the degree to which it differs from the null hypothesis. We assume that the null hypothesis explains the volume of loans by independent variables, and the one hypothesis does not explain the opposite to the null. In this case, r values below 0.05 prove the null hypothesis, and above 0.05 prove the one hypothesis. So, through this criterion, we will have to exclude some factors from the model.

In order to better understand the statistics of multicollinearity, we will consider the results of its separate analysis in the following 5 tables. In this case, the external factors determined based on r value in table 4 above, including Deposits (r=0.290), Net profit (r=0.147), Interest rate on foreign currency loans (r=0.704), Bank loans (r=0.665), software The factor automatically excluded by

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the supply, i.e. interest-free income (r=0.274), in table 5, the factors of interest rates on loans in national and foreign currency are also excluded from the composition of factors, as the value of r, which determines the level of significance in correlation with other factors, is higher than the threshold value of 0.05 let's throw

So we sort the input data by determining the standard residual and standard prediction values and the Cook's covariance measures. The purpose of obtaining standard values is that the criteria that they fall within certain threshold ranges allows us to filter out unwanted data. In Cook's difference, this norm is not to exceed 1.

The results obtained in this way are reflected in the following table.

Table 3

Data on the coefficients [a] that describe the factors in the regression model

Model		Unstandardized coefficients		Standardized coefficients	t	r is the value	Multicollinearity statistics	
		B weights	Standard error	B weights			Acceptance	VIF
1	(Constant)	8380,703	1255,188		6,677	,000		
	Banks.loans.balance	,986	,001	,999	674,818	,000	,955	1,047
	Mil. currency. loan. interest	-174,243	59,991	-,006	-2,904	,007	,518	1,929
	Hor.currency.loan.percentage	84,722	208,623	,001	,406	,687	,532	1,878

a. Dependent variable: Loans

So, we will perform a re-regression analysis of the remaining independent factors after the performed actions, and check the change of the main econometric indicators and the quality of the constructed model. To do this, we analyze the results by performing the previous steps step by step.

Table 4

Diagnostics of multicollinearity [a]

Model	Variable	Eigen value	Indicator of conditionality	Proportions of variance			
				(Constant)	Banks.loans.balance	Mil. currency. loan. interest	Hor.currency.loan.percentage
1	1	3,972	1,000	,00	,00	,00	,00
	2	,024	12,904	,00	,78	,02	,01
	3	,002	42,198	,96	,22	,27	,06
	4	,002	51,438	,04	,00	,71	,93

a. Dependent variable: Loans

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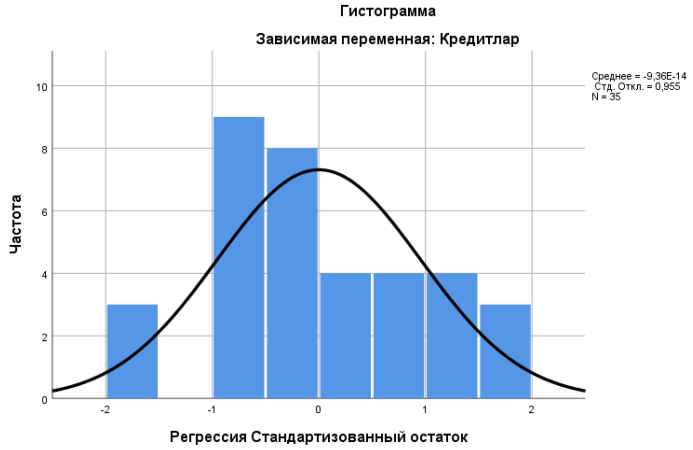
The Xor.currency.credit.percentage factor in both tables above did not meet the conditions of multicollinearity. Eigenvalues approaching zero cause the conditionality index to increase, and values above 30 indicate a strong collinearity problem. If this situation is observed, it is necessary to look at the percentage of variances, and if the value of the variable in it is higher than 0.9, it should be removed from the model. So, in our case, this is the interest rate factor on loans in foreign currency.

A further test is whether the residuals follow a normal distribution. For this we use histogram and graph.



Since it is difficult to check the normality condition through images, we check the normality of the residuals. As a result, according to the table below , we will have Kolmagorov -Smirnov and Shapiro Wilk criteria.-

What is important here is the r value indicator, that is, according to it, if the threshold criterion is higher than 0.05, the condition of normality is satisfied. In both Kolmagorov -Smirnov and Shapiro -Wilk, this indicator is higher than 0.05.

should be spread randomly in the interval (3;3) on both axes according to the criterion. -In fact, we can be sure of this by looking at the picture. That is, the success of the model is determined by the fact that the spread in this picture does not obey a certain rule. In other words, heteroskedasticity should not occur. Of course, since this cannot be determined or explained by observation, the preferred approach is to test for heteroskedasticity. Since it is not possible to perform this test in SPSS Statistics, we pass to the next conditions.

Conclusions and suggestions

The econometric analysis of the factors affecting the quality of bank assets revealed that the autocorrelation index is equal to 2.637, the correlation of the

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square and cubic regression equations is lower than 0.7, indicating that there is no multicollinearity problem, and the independent variables are mutually distinguishable factors.

5 -tables

Statistical summary and parameter values

The type of equation	Statistical summary				Parameter values		
	R-squared	F	r	Constanta	b1	b2	b3
Linear	,047	1,613	,213	435420,887	-6443,507		
Logarithmic	,033	1,131	,295	666858,582	-120811,181		
The opposite	,022	,740	,396	194817,550	2166870,202		
Square	,502	16,100	,000	-4089291,841	400336,894	-9092,071	
Cubic	,509	16,558	,000	-1159155,136	,000	9046,459	-272,496
Exponential	,077	2,759	,106	547439,192	-,029		
Logistics	,077	2,759	,106	1,827E-6	1,029		

Dependent variable: Loans
Independent variable - Mile.currency.credit.percentage.

According to the table, it is concluded that the equations that most closely explain the relationship can be represented by statistical significance, that is, by quadratic and cubic functions on the value of r. In this case, the quadratic and cubic regression equations are expressed as follows:

1. $Y=-4089291.841+400336.894*X^{2}-9092.071*X$
2. $Y=-1159155,136+0*X^{3}+9046,459*X^{2}-272,496*X$

The results of the analysis for the regression equation for the final independent factors and the dependent factor are reflected in the table below.

6 -tables

Correlations

		Credits	Banks.loans.balance	Mil. currency. loan. interest
Pearson Correlation	Credits	1,000	1,000	-,216
	Banks.loans.balance	1,000	1,000	-,211
	Mil. currency. loan. interest	-,216	-,211	1,000
So. (relative)	Credits	.	,000	,107
	Banks.loans.balance	,000	.	,112
	Mil. currency. loan. interest	,107	,112	.
N	Credits	35	35	35
	Banks.loans.balance	35	35	35
	Mil. currency. loan. interest	35	35	35

Although the correlation has a negative sign, its value lower than 0.7 means that there is no multicollinearity problem in this aspect and the independent variables are positively evaluated as mutually different factors.

7 -tables

Statistical inferences about the regression equation [b]

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Model	R	R-squared	Corrected R-squared	It's more than standard	Darbin-Watson
1	1,000 [a]	1,000	1,000	403.44829	2,197

a. Predictors: (constant), Mil.currency.loan.interest, Bank.loans.balance
b. Dependent variable: Loans

R-squared and Darbin-Watson indicators have values within the criterion requirements. This test is also evaluated positively.

8 -tables

ANOVA [a]

Model		Amount squared	st.	Average square	F	Significantly
1	Regression	79839164266,889	2	39919582133,444	245250,680	,000 [p]
	Ostatok	5208656,819	32	162770.526		
	Everything	79844372923,708	34			

a. Dependent variable: Loans
b. Predictors: (constant), Mil.currency.loan.interest, Bank.loans.balance

9 -tables

Coefficient [a]

Model		Unstandardized coefficients		Standardized coefficients			95.0% Confidence Interval for B		Statistical collinearity	
		B	Standartnaya oshibka	Beta	t	Significantly	Nizhnyaya Granitsa	Verkhnyaya granitsa	Dopusk	VIF
1	(Constant)	8593,516	1125,582		7,635	,000	6300,781	10886.250		
	Banks.loans.balance	,986	,001	,999	683,848	,000	,983	,989	,956	1,047
	Mil. currency. loan. interest	-157,764	43,604	-,005	-3,618	,001	-246,581	-68,946	,956	1,047

a. Dependent variable: Loans

10 -tables

Diagnostics is collinear under [a]

Model	Izmerenie	Sobstvennoe znachenie	Pokazatel obuslovlennosti	(Constant)	Dolly dispersion Banks.loans.balance	Mil. currency. loan. interest
1	1	2,977	1,000	,00	,00	,00
	2	,021	11,966	,01	,79	,06
	3	,002	37,042	,98	,20	,93

a. Dependent variable: Loans

11 -tables

Statistics ostatkov [a]

	Minimum	Maximum	Average	Standard correction	N
Predskazannoe znachenie	211639,3594	381842.8125	294197.6143	48458,33998	35
Ostatok	-767.13959	771.42096	,00000	391.40234	35
Standartnaya Predskazannoe znachenie	-1,704	1,809	,000	1,000	35
Standartnaya Ostatok	-1,901	1,912	,000	,970	35

a. Dependent variable: Loans

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In order to determine the statistical significance of the independent variables explaining the related indicator, these statistical data should be sorted and econometric tests should be performed.

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