

Model to Determine the Impact of Commercial Banks on the Level of Risk through Diversification of Credit Portfolio

Nabiev Bekzod Kamoldinovich 1

Abstract: This article discusses the use of an industry cluster of commercial banks to reduce the level of risks affecting them on the basis of the diversification of the loan portfolio.

Keywords: loan portfolio, diversification, financial risks, return on assets, model, problem loan, NPL.

1 Inspector of the Tashkent regional customs department

Introduction

Introduction of digital technologies into the economy credit operations occupy an important place in the conditions of liberalization of the banking system. Since the credit operations of commercial banks are the income-generating activity of the bank, ensuring the stability of the quality level of the loan portfolio is one of the main tasks of banks today. Lending is a type of activity of paramount importance for commercial banks, since the decline in the quality of the loan portfolio of commercial banks negatively affects their financial stability, i.e. An increase in the weight of overdue loans in the volume of credit investments leads to a sharp decrease in the bank's liquidity.

In foreign banking practice, this process, i.e. loans issued by banks, but the conditions of which are not met (Non-Performing Loans NPL), is considered in domestic banking practice as overdue or problem loans. It is known from foreign banking experience that there is no possibility of reducing the share of problem loans to zero in the structure of the loan portfolio of commercial banks. In this regard, no commercial bank is free from this problem, usually in the structure of the loan portfolio of commercial banks, the share of these loans in their assets is from 1.5 to 10 percent, and in some cases even higher

As a result of the growth of problem loans, the impact of financial risks on the activities of banks increases. This will require banks to choose the optimal way to reduce the level of risks by diversifying the loan portfolio. The analysis of the impact of industry clusters on the reduction of the level of risks by banks due to the diversification of the loan portfolio is considered as one of the topical issues. Therefore, effective management of the loan portfolio of commercial banks allows meeting the needs of economic entities in credit funds.

The increase in the volume of bank loans directed to the development of the economy in the republic, the increase in the number of various owners and economic entities using them, the rational placement of loans provided by banks, increasing their efficiency, ensuring timely recovery of accrued interest on loans issued, justify the need for constant monitoring of the banks' loan portfolio.

Literature review: The issues of improving the efficiency of credit portfolio management in commercial banks have been studied in the studies of a number of foreign scientists, and the concept of a credit portfolio is expressed in the definitions given to its essence. For example, the American economist Chris J. Barleton describes that the loan portfolio of Diana McNaughton, which includes the classification of loans¹.

The National Bank of Tajikistan (NBT) sees no reason for sharp jumps in the dollar exchange rate on the foreign exchange market of the republic in the near future. In particular, dealer banks affect the portfolio of risks of a long-term effect. Uzbek economists like Burada have conducted a number of studies, especially, according to Sh. Z. Abdullayev, credit portfolios of banks are based on different credit risks and a set of loans based on the consumer bank. Economic scientists in their definitions separately focused on the risks in banks considering them by certain

¹Диана Мак Нотон. Банковские учреждения в развивающихся странах.- ИЭРМБПР.- ВашингтонД.С., 2001.-с.75

properties².

In some studies conducted, lending is the main activity of most commercial banks. A loan portfolio is usually the largest asset and the main source of income. Thus, this is one of the main sources of risk for the security and reliability of banks. They explain that problems with the loan portfolio have historically been the main cause of losses and bank failures, whether due to weak lending standards, poor portfolio risk management or a weak economy. They believe that proper management of the loan portfolio is the most important means of preventing risks affecting the bank's activities³.

Some scientists believe that in today's dynamic world, the financial situation or business prospects of a borrower can change quickly and often without warning. Credit monitoring should be carried out proactively, impartially and constantly, taking into account various economic information about counterparties, consumers, industry, macro - and regional economic data, in order to reduce the risk of non-payments on the loan .

Scientists believe that the bank is achieved by accurately modeling the distribution of credit risks for marginal and absolute conditional losses on any loan portfolio. They believe that such a distribution of losses across the portfolio may depend on the current state of the economy, taking into account the country, industry and the rating of the counterparty. The conditional relationship between the probability of a credit event (for example, migration or credit rating failure) and the current state of the business cycle is based on empirical data observed in historical data. This model differs from other models of credit portfolio of several important aspects:

First, it simulates the actual discrete distribution losses, depending on the number and size of the debt, in contrast to the expected indicators of the normal distribution or the average of the variance; this enables the model to accurately display a big "risk premium" on capital, adjusted for risk is less diversified portfolios.

Secondly, losses (or gains) are measured based on the market value for loans that can be liquidated by the impact of the loan (for example, for most loans or over-the-counter trading lines), as well as for loans that can be liquidated before the maximum term. Thus, this distribution of losses can be included in the schedule for any period of time, including the corresponding process of planning and budgeting of the organization.

Third, the distribution of losses in the tables is based on the current state of the economy, and this situation is not based on 20-year averages, which does not reflect the real risk of the portfolio.

Finally, unlike a single-factor model based on asset volatility and the history of CAPM or mass ratings, a multi-factor model of systematic default risk is evaluated accurately based on empirically observed " regional and industry betas⁴.

Analysis: Most of the assets of the banking sector of Uzbekistan are concentrated in state-owned banks. As of May 1, 2021, the total share of the three largest banks (the National Bank of Uzbekistan, Asaka Bank, Sanoatkurilishbank) accounts for almost 55 percent of assets in the entire banking sector. And 86 percent of the total assets of the banking sector are accounted for

²Абдуллаева ШЗ. Банк рисклари ва кредитлаш. Т.: Молия, 2002. 304 б. Б – 166.

³<https://www.igi-global.com/chapter/managing-credit-risk-in-bank-loan-portfolio/213276>

⁴https://link.springer.com/chapter/10.1007/978-3-642-58272-1_14

by state-owned banks. State-owned banks are in a strong position. This is due to their important function as the main creditor of state investment projects within the framework of economic and social programs. In turn, the government supports state-owned banks by issuing and placing deposit funds at preferential interest rates, as well as increasing the capital of banks .

Due to the rapid development of the country's economy and the ongoing reforms, the banking sector has great potential, especially for foreign investors. However, apart from the announcement of the opening of a branch of the People's Bank of Kazakhstan over the past two years and the plans of the Georgian TBC Vapki to enter the banking market of Uzbekistan, no other agreements have been signed by foreign companies or banks in this regard. It can be noted that the partner bank of the Swiss investment fund responsibility will be among the shareholders, but according to the agreement, this share is small-only 7.7 percent. At the same time, in the banking sector, local companies carried out transactions to buy shares of private banks, such as Capital bank and Haik-tek bank. State reforms in the banking sector are aimed at reducing the concentration of their assets in the banking sector by privatizing a certain part of state-owned banks and increasing competition. It is assumed that state-owned banks will reduce the volume of concessional lending by switching to market sources of financing in the deposit market, domestic and international capital markets, and also partially sell their shares to foreign investors. The government has decided to sell 5 percent of the shares of three banks, whose share in the banking market is 25 percent. In addition, foreign investors were granted the right to buy up to 5 percent of banks ' shares without the permission of the central bank.

As for large state-owned banks, some of them have established cooperation with international financial institutions. In particular, in 2018, the International Finance Corporation (IFC) launched a partnership with the Mortgage Bank to improve corporate governance, risk management and operational activities within the framework of the possibility of participating in future bank capital. According to this, IFC has raised about \$ 35 million. Allocates a credit line in the amount of US dollars and conducts a partial privatization of the bank until 2022. The ICRC is also negotiating with the Industrial Construction Bank on a similar project, while the European Bank for Development and Reconstruction (EBRD) is considering participating in the privatization process of Asaka Bank.

The increase in lending volumes is observed in all sectors of the economy. Such factors as programs for the development of agriculture, small and medium-sized businesses, and increased investments in the modernization of state-owned enterprises led to a sharp increase in lending volumes. In addition, the large-scale reforms carried out in the republic and the processes of liberalization of many sectors of the country's economy also increase the demand for loans. The highest growth rates are observed in the volume of loans issued to the population.

Today, the credit deposits of commercial banks of the Republic are quite diversified, and the risks associated with the activities of economic sectors in the banking system of the Republic are formed moderately. In particular, as of May 1, 2021, 35.1 percent of credit investments of commercial banks accounted for industry, 9.7 percent-for transport and communications, 20.1 percent-for individuals, 7.7 percent-for trade and general services, 10.9 percent-for agriculture and 2.7 percent-for the construction sector. In one year, the main changes in the loan portfolio of commercial banks were observed in individuals (1.2%), agriculture (1.4%) and trade and general services (0.8%). In general, the diversification of the loan portfolio of commercial banks can be regarded as positive. But its share in the industrial sector is 35.1%, which is 5% higher than the established demand (with diversification, the share of lending in one sector should not exceed

30%).

Table – 1 The share of commercial banks in credit institutions by sector⁵

Name of indicators	01.05.2020 й.		01.05.2021 й.		Изменение, в процентах
	млрд. сўм	доля, в процентах	млрд. сўм	доля, в процентах	
Total credits	232 302	100%	292 029	100%	25,7%
Industry	84 798	36,5%	102 522	35,1%	20,9%
Agricultural industry	21 983	9,5%	31 795	10,9%	44,6%
Construction sector	6 293	2,7%	7 818	2,7%	24,2%
Sales and General service	16 116	6,9%	22 426	7,7%	39,2%
Transport and communications	24 913	10,7%	28 363	9,7%	13,8%
Development of material and technical support	3 694	1,6%	4 057	1,4%	9,8%
Housing and communal services	2 649	1,1%	4 531	1,6%	71,1%
Individuals	43 821	18,9%	58 742	20,1%	34,0%
Other areas	28 036	12,1%	31 776	10,9%	13,3%

The bank's goal in risk management is to ensure the repayment of all its assets and narrow the boundaries of possible fluctuations. Usually, when talking about risk, experts mean, first of all, credit risk, that is, the risk of non-repayment of the loan and the interest accrued on it. This level of risk is influenced by the structure of the clientele and one of the factors that greatly influence its assessment is the method of calculating the client's creditworthiness. To reduce the credit risk and the number of problem loans, it is necessary to carefully assess the creditworthiness of customers and choose an effective method of managing their risks. This makes it necessary to improve the practice of collecting problem loans available in the loan portfolio of commercial banks, and is one of the most important conditions for the development of the banking system⁶.

The occurrence of problem loans is associated with the influence of credit risk, as a result of which the bank is concerned that the borrower will not be able to repay its obligations under the loan agreement in full and on time, and the bank will incur losses related to the provision of loans to such borrowers. Therefore, in banking practice, problem loans are often called low-quality loans. This interpretation of problem loans focuses on losses as a result of the onset of problems. However, not every problem loan ends in losses. The bank's task is to prevent or minimize possible losses⁷.

As for the quality of the loan portfolio, the current level of problem loans (inactive loans) is significantly lower than in Russia and other Central Asian countries. Although the volume of

⁵<https://cbu.uz/oz/statistics/bankstats/506819/>

⁶http://iqtisodiyot.tsue.uz/sites/default/files/maqolalar/1_Kalandarov.pdf

⁷Муаммоли кредитларга (Non-performing loan, фаолиятсиз кредитлар) тўлаш вақти 90 кундан ортиққа кечиккан, қониқарсиз, шубҳали ва ишончсиз, деб таснифланган кредитлар қиради.

non-performing loans has increased by 2 times since 2018, their ratio to the total volume of loans as of the 3rd quarter of 2019 is only 1.3%. It is expected that in the medium term, the share of non-performing loans will remain at a consistently low level.

Corporate loans make up the majority of the banks' loan portfolio. Although lending to legal entities is diversified by economic sectors, there is a risk of serious concentration in the public sector. This is due to the fact that state-owned banks finance mainly state-owned enterprises, providing targeted loans on preferential terms.

According to the report of the Central Bank on the development of the banking system in 2019, the volume of problem loans of the country's banks at the beginning of the year amounted to a total of 3.2 trillion soums, of which unsatisfactory — 43%, doubtful — 19% and bad — 38%.

The share of problem loans in the total volume of loans is an indicator of the quality of the loan portfolio, the increase of which is the main factor leading to serious losses and liquidity problems in the future, the report says. As of January 1, 2020, this figure was 1.5%.

The decrease in the quality of assets in banks is the ratio of the decrease in capital to total capital, indicating the likely amount of the decrease in the bank's capital, which in 2019 decreased by 1.6% and amounted to 2.7% as of January 1. More than 18 thousand enterprises that stopped their work due to quarantine remained in debt to banks.⁸

Объем проблемных кредитов по сравнению с началом года составил 4,4 трлн.суммы выросли, и это в основном на вклады государственных банков.

The volume of non-performing loans compared to the beginning of the year amounted to 4.4 trillion. The amounts have increased, and this is mainly on deposits of state-owned banks.

As of February 1, 2021, problem loans (NPFs) in commercial banks amount to 7 trillion 487 billion soums.

As of February 1, 2021, problem loans of commercial banks commercial banks have allocated a total of 277 trillion 755 billion soums of loans to individuals and legal entities, of which 7 trillion 487 billion soums or 2.7 percent are problem loans. This figure was 2.3 percent as of April 1, 2020 and 2.4 percent as of December 1.

In addition, the share of non-performing loans (NP) in the total loan portfolio exceeded 10 percent in 2 banks, reaching 14.2 percent in Uzagroexportbank and 16.1 percent in Madad Invest Bank.

As of February 1, 2021, the percentage of problem mortgages was 4.5 percent. The benefits provided on mortgage loans may outweigh the share of NPL⁹.

The total balance of bank loans as of April 1, 2021 is 283.5 trillion soums.

History of legal entities- \$ 226.7 trillion. Soums of individuals – 56.8 trillion. There are balances on loans in rubles. On loans allocated to individuals:

Mortgages for 29.4 trillion soums; car loans and consumer loans for 12.1 trillion soums;

9.3 trillion soums of loans allocated for entrepreneurship; there are balances of loans on microloans for 5.9 trillion soums.

⁸<https://www.gazeta.uz/uz/2020/08/04/loan/>

⁹<https://kun.uz/news/2021/03/04/tijorat-banklarida-muammoli-kreditlar-ulushi-27-foizga-yetdi>

In addition, in the structure of loans, the amount of non-performing loans (NPL) is 10.2 trillion US dollars. the amount amounted to 3.6% of the total loan portfolio.

The volume of non-performing loans compared to the beginning of the year amounted to 4.4 trillion.the amounts have increased, and this is mainly on deposits of state-owned banks.

According to the Central Bank as of April 1 of this year:

The total loan portfolio of Hi-Tech Bank is 201 billion US dollars.soums, of which \$ 179 billion Sumi, or 89.4%, became problem loans (NPL); the loan portfolio in Turkestan Bank is \$ 703 billion.Soums, including problem loans-610 billion.Sum or 86.7%; the loan portfolio of Madad Invest Bank is \$ 123 billion.soums, including problem loans-57 billion.Sum, or 46.6%.

Banks with a state share exceeding the established norm for the share of problem loans in the loan portfolio were Halyk Bank (5.9%), Asian Alliance Bank (8.9%) and Uzagroexportbank (54.6%).

Table – 2 About problem loans (NPL) of commercial banks As of May 1, 2021¹⁰

billion soums

№	Name of the bank	Loan portfolio	Non-performing Loans (NPL)	The share of problem loans in the total volume of loans
Total		292 029	12 933	4,4%
State-owned banks		256 649	11 188	4,4%
1	National bank	66 455	2 641	4,0%
2	Uzsanoatqurilishbank	39 868	1 552	3,9%
3	Asaka bank	36 074	1 749	4,8%
4	Agrobank	29 198	1 114	3,8%
5	Ipoteka bank	25 029	1 201	4,8%
6	Axoli bank	20 183	1 185	5,9%
7	Rural Construction bank	14 547	716	4,9%
8	Mikrokreditbank	9 794	331	3,4%
9	Turan bank	7 244	239	3,3%
10	Aloqa bank	6 140	256	4,2%
11	Asia Alyans bank	1 947	163	8,4%
12	Capital bank	106	7	6,7%
13	Uzagroeksportbank	63	34	54,6%
Other banks		35 380	1 745	4,9%
14	Hamkor Bank	7 935	349	4,4%
15	Ipak yili bank	5 676	190	3,4%
16	Capital Bank	5 212	57	1,1%
17	Orient Finance Bank	3 592	76	2,1%
18	Invest Finance Bank	3 078	16	0,5%
19	Trust Bank	2 292	76	3,3%

The situation in almost all banks can be assessed as positive when we analyze other banks (it is established that the share of problem loans does not exceed 5%).

¹⁰<https://cbu.uz/oz/statistics/bankstats/526078/>

It is noted that as of May 1, the volume of problem loans reached 13.5 trillion soums, an increase of 2 times compared to the beginning of the year. In the context of the spheres, problem loans were formed in industry — 3 trillion soums, trade and services - 2.1 trillion soums, agriculture-1.8 trillion soums, construction-978 billion soums, transport and communications-547 billion soums.

In the context of regions, each of the Jizzakh, Samarkand, Surkhandarya and Tashkent regions accounts for about 1 trillion soums of problem loans.

The main part of problem loans falls on the city of Tashkent (90 billion soums), Andijan (35 billion soums), Tashkent region (28 billion soums), Ferghana (27 billion soums), Surkhandarya (26 billion soums) and Samarkand (22 billion soums). Of the 4.2 thousand projects implemented within the framework of regional programs over the past 3 years, 50 percent are due to loans in the amount of 16 trillion soums, and for 2.5 thousand projects in the amount of 11.5 trillion soums this year, 80 percent of cash receipts are distributed outside the bank¹¹.

As of May 1 of this year, the share of non-performing loans (NPL) in the portfolio of banks in Uzbekistan reached 4.4 percent. And a month ago, this indicator increased by 3.6 percent. This is reported on the website of the central bank.

This is how the indicator of problem loans continues to grow. In particular, this trend is high in "Uzmillibank", "Agrobank", "People's Bank", "Kishtish Inshaat Bank", "Asakabank". In some banks, the level of problem loans (NPL) is very high. Non-performing loans account for 89.4% of the loan portfolio of Hack-tech Bank, 86.7% in Turkestan Bank and 46.6% in Madad Invest Bank. For comparison, in the case of January 1, non-performing loans in these banks составляли 0,2%, 0,1% и 20,2% соответственно.

Table – 3 Indicators of profitability of the banking system¹²

Indicators	01.05.2020 й.	01.05.2021 й.
Ratio of net profit to total assets of AC before taxes (ROA)	2,4	1,8
Net income to total equity ratio (ROE)	10,6	8,7
The ratio of net interest income to total assets	4,2	4,1
The ratio of net interest income received on loans to total loan investments	5,5	5,3
Ratio of net interest income to total liabilities	5,2	4,8
The ratio of net interest margin to total assets	4,5	4,2

The profitability indicators of the banking system of the republic tend to decrease compared to 2020. One of the main reasons is the increase in the share of problem loans.

In the first quarter of 2021, the banking sector of Uzbekistan received a net profit of 1.47 trillion soums. This is 5.8% more than in the same period last year. This is evidenced by the statistics published by the Central Bank

Such a slowdown in net profit growth is observed against the background of an increase in the volume of problem loans. In three months, their share in the total loan portfolio increased from

¹¹<https://xs.uz/uzkr/post/kreditlarni-qajtarilishi-uchun-bosh-vazir-orinbosarlari-hokimlar-sektorlar-va-tizhorat-banklari-rahbarlari-shakhsan-zhavob-beradi>

¹²<https://cbu.uz/oz/statistics/bankstats/526043/>

2.1% to 3.6%. And in monetary terms-5.8 trillion. of these, 10.2 trillion. the amount has increased. The total interest and interest-free income of the banking sector amounted to 6.22 trillion rubles. sum, which is 1.5 times more than in the same period of 2020. The estimate of possible losses on loans and leases as of April 1 amounted to 4.28 trillion soums, which is 1.8 times more than a year earlier.

Most banks in the banking sector have published their financial reports for the first quarter. In particular, in the first three months of 2021, Anorbank, created in a digital format, received a net profit of 717.9 million soums. TBK Bank, the "twin" of Anorbank, ended the first quarter with a loss of 14.7 billion. The round ended in defeat.

We will analyze the economic indicators of the Trust Bank operating in our Republic.

Table – 4 Economic indicators of the private commercial bank "Trustbank" ¹³

№	Indicators	2016	2017	2018	2019	2020
1.	Net income	36450802	61094949	100820120	184791037	300602268
2.	Share capital	41961733	101961733	161961733	226961733	361961733
3.	Evaluations	1413667590	1771283785	2742264961	3326814813	4703730695
4.	Net income to assets ratio (ROA) total	2,6	3,4	3,7	5,6	6,4

Analyzing the bank's indicators, you can see that it is growing from year to year. In particular, the bank's annual net profit by the end of 2020 increased by 264151466 soums compared to 2016. Assets increased by 3290063105 soums in 2020 compared to 2016. The ratio of net profit to total assets (ROA) tended to increase over the analyzed years compared to 2016.

When determining the level of risk affecting the bank's loan portfolio, we will consider the impact of their diversification. To do this, we use a model of corporate loan portfolio diversification based on sectors in the bank's risk management, which is widely used in practice¹⁴.

Table – 5 Indicators of Trustbank's loan portfolio by sector ¹⁵

Sphares	2016		2017		2018		2019		2020	
	millio n soums	Frac - tion	millio n soums	Frac - tion	millio n soums	Frac - tion	millio n soums	Frac - tion	millio n soums	Frac - tion
Industry	120,3	21,1	145,8	17,2	489,9	37,2	345,7	19,3	463,7	19,9
Agricultural industry	56,7	9,9	101,3	12,0	138,6	10,5	356,4	19,9	469,3	20,1
Construction	89,3	15,7	128,8	15,2	149,7	11,4	274,1	15,3	387,9	16,6
Trade and public catering	79,6	14,0	135,6	16,0	136,9	10,4	223,1	12,4	336,7	14,4

¹³<https://trustbank.uz/ru/shareholders/reports/>

¹⁴Ушбу модел А.Ю. Домников, Е.С. Кондюкова, Е.Г. Шершневалар томонидан аудит и финансовый анализ журналида 2015 йил 1-сонида эълон қилинган мақола асосида тайёрланди.

¹⁵<https://trustbank.uz/ru/shareholders/reports/>

Transport and general communications	145	25,4	160,4	18,9	165,4	12,5	312,4	17,4	415,6	17,8
Logistics and sales	58,3	10,2	118,4	14,0	125,4	9,5	145,7	8,1	135,6	5,8
Other networks	21,1	3,7	56,4	6,7	112,3	8,5	135,1	7,5	125,8	5,4
Total	570,3	100	846,7	100	1318,2	100	1792,5	100	2334,6	100

Analyzing the bank's cross-industry loan portfolio, diversification in all sectors can be assessed as positive by 2020.

In practice, the degree of diversification can be estimated depending on a large or smaller number of sectors in the bank's loan portfolio. In particular, if there are n sectors in the bank's loan portfolio, then its level will be as follows:

1. If, $n \leq 3$, the probability of diversification is low.
2. If, $4 \leq n \leq 7$, then the degree of diversification is average.
3. If, $8 \leq n \leq 10$, the degree of diversification is sufficient.
4. If, $11 \leq n \leq 13$, the degree of diversification is high.
5. If, $n \geq 14$, the degree of diversification is considered extremely high.

The level of diversification can be interpreted as sufficient if we evaluate the bank analyzed by the criterion. But the second side of the question is that even if the level of diversification is positive, banks will not be able to determine the probability of risks affecting the loan portfolio. Therefore, it is important to assess the risks affecting the bank's loan portfolio through the diversification process. To do this, we will analyze the loan portfolio of Trustbank into categories of lending by industry.

Table – 6 Categories of Trustbank's industry lending, taking into account risk factors

Common risk factors	General categories of industry lending, taking into account risk factors		
	H1, in one step	H2, uniform with respect to others	H3, not out of the blue
The level of self-financing of the network	Up to 50%, industry, agriculture, construction	Up to 30-50%, trade and public catering, transport and general communications	Less than 30%, logistics and sales
The share of obligations of enterprises and organizations to the bank	Up to 30%, industry	Up to 30-50%, logistics and sales, construction, trade and catering, transport and general communications	More than 50%, agriculture
The share of overdue loans of industries in the total volume of	Up to 10%, industry, logistics and sales, construction, transport and general	10-30%, trade and catering,	Above 30%, other industries

loans issued	communications, agriculture		
The current liquidity ratio of the networks The	150% and above, industry, construction	130-150%, logistics and sales, transport and general communications	130% or less, trade and public catering
profitability of the assets of the industries	10% and above, industry, construction	5-9. 9%, logistics and sales, transport and general communications	5% and less, trade and public catering,
Investments in fixed assets	10% and above, industry, construction	5-9. 9%, logistics and sales	5% and less, trade and public catering, transport and general communications
Reliability coefficient	Tall. Industry	Average. Construction, transport and general communications	Low. Logistics and sales, trade and catering, transport and general communications

Based on the table above, we can divide the networks into the following groups based on cluster analysis:

H1-industry, construction;

H2-agriculture, trade and public catering;

H3-transport and general communications, logistics and sales, other industries.

The structure of the bank's loan portfolio (KP) by industry will look as follows:

$$KP = a * X1 + b * X2 + c * X3 \quad (1)$$

Where A is the share of networks belonging to group H1, b is the share of networks belonging to group H2, s is the share of networks belonging to group H3.

5-higher. according to the table and Formula (1), the calculation of the bank's loan portfolio by industry based on risk factors will look like this:

$$\begin{aligned} KP_{2016} &= (21.1 + 15.7) * X1 + (9.9 + 14) * X2 + (25.4 + 10.2 + 3.7) * X3 \\ &= 36,8X1 + 23,9X2 + 39,3X3 \end{aligned}$$

$$\begin{aligned} KP_{2017} &= (21.1 + 15.7) * X1 + (9.9 + 14) * X2 + (25.4 + 10.2 + 3.7) * X3 \\ &= 32,4X1 + 28X2 + 39,6X3 \end{aligned}$$

$$\begin{aligned} KP_{2018} &= (37.2 + 11.4) * X1 + (10,5 + 10,4) * X2 + (12.5 + 9,5 + 8.5) * X3 \\ &= 48,6X1 + 20,9X2 + 30,5X3 \end{aligned}$$

$$\begin{aligned}
 KP_{2019} &= (19.3 + 15.3) * X1 + (19.9 + 12,4) * X2 + (17.4 + 8.1 + 7.5) * X3 \\
 &= 34,6X1 + 32,3X2 + 33X3
 \end{aligned}$$

$$\begin{aligned}
 KP_{2020} &= (19.9 + 16.6) * X1 + (20.1 + 14,4) * X2 + (17.8 + 5.8 + 5.4) * X3 \\
 &= 36,5X1 + 34,5X2 + 29X3
 \end{aligned}$$

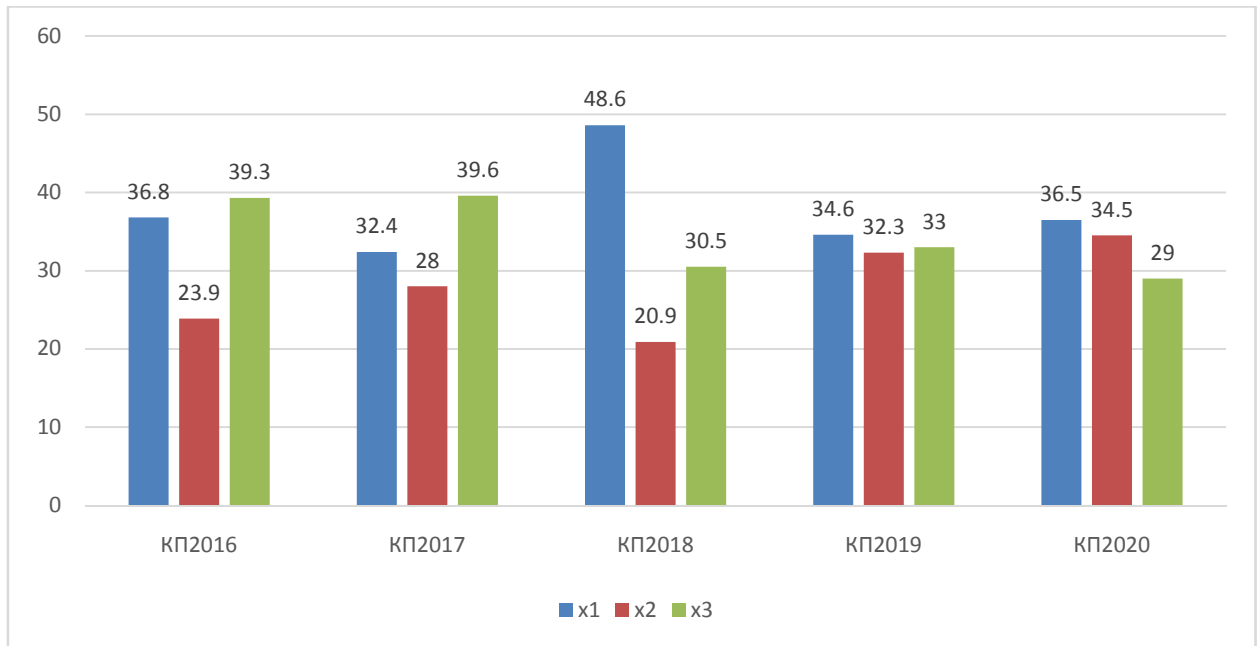
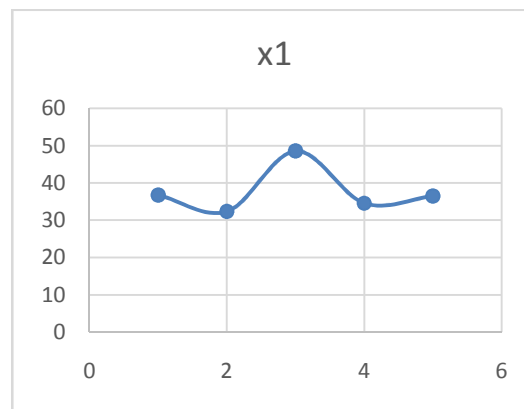
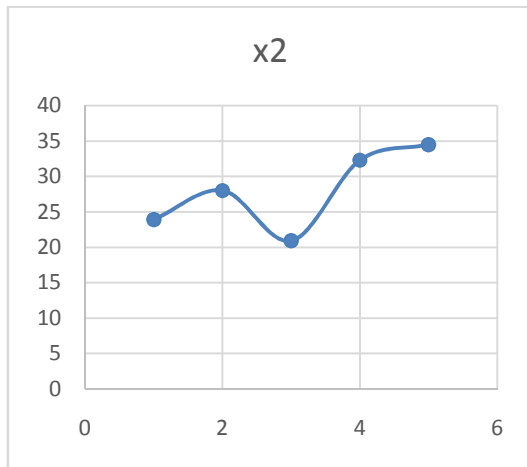


Fig. 1. The result of calculating the bank's loan portfolio based on risk factors.



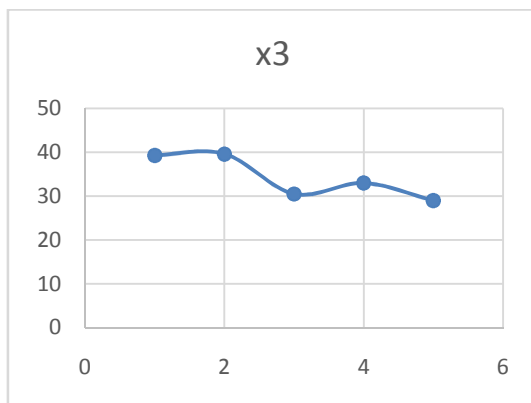
If we pay attention to the dynamics of changes over the years, based on the industry and construction selective cluster of Trustbank, then compared to the situation in the loan portfolio in 2016, these industries showed a certain decline in 2017, the greatest result was achieved in 2018, and in the remaining years the share of these industries in the bank's loan portfolio decreased. But compared to other industries, the share of these industries in the loan portfolio remains high.



The change in the share in the loan portfolio of the sectors of agriculture, trade and public catering selected by clusters may be observed with a sharp increase after 2018. The main reason for this can be estimated by the sharp increase in demand in agriculture, trade and public catering in the context of the pandemic of late 2019-early 2020.

This is due to the increased demand for bank loans.

The selected tertiary industries tend to decrease in comparison with 2017 the share in the loan portfolio in the field of transport and general communications, logistics and sales, and other industries. Despite the fact that the share of this sector in the bank's loan portfolio will be the highest in 2016 according to compared to other sectors, by 2020



The origin has plummeted compared to other clusters. The occurrence of such a situation can be assessed by the fact that applications for bank loans in these areas have decreased in the context of the pandemic.

This means that the risk rating of the bank's loan portfolio in the network can be considered aggressive in 2016. In 2018, the level of risk in the bank's loan portfolio is comfortable, and it can be concluded that the level of risk for the remaining years is in a neutral position.

Our next analysis will allow us to assess the bank's income and the risk of the loan portfolio.

Based on the above analysis, and the analysis of risk factors based on the cluster of sectors, we use the equation of factors that stem from the practice of determining the income of the Bank and portfolio risk:

$KQD(\text{income credit investments, \%}) = RK(\text{risk ratio, losses from credit investments, \%}) * KQK$
(the ratio of overdue loans from interest income).

Both the ROK (risk ratio, losses from credit investments,%) and the ROK (repayment ratio of overdue loans from interest income) are calculated as follows:

$$PK = \frac{\text{overdue debt}}{\sum \text{credit investments} - \text{losses on the loan accumulation reserve}} * 100\% (2)$$

$$KKK = \frac{\text{Interest income}}{\text{overdue debt}} (3)$$

Using the confidence indicators in 2020, we can make the following table:

Table – 7 Trustbank's loan portfolio indicators (for 2020)

№	Industry Group	The amount of credit investments	Overdue debt	Loan loss coverage reserve	Amount of interest income
1.	X1	456325654	86412562	135213456	180131302
2.	X2	356874695	100256254	101235654	170231162
3.	X3	245125458	65897412	98125456	114163503
4.	Total	1058325807	252566228	334574566	464525967

$$KKDX1 = \left[\frac{86412562}{456325654 - 135213456} * 100 \right] * \left[\frac{180131302}{86412562} \right] = 26,9$$

$$KKDX2 = 39,2$$

$$KKDX3 = 44,8$$

Using the above Formulas (2) and (3), we get the following results:

Table – 8 Results of KCD (return on credit investments, %), RC (risk coefficient, losses from credit investments, %) and KCD (coefficient of coverage of overdue loans with interest income) for the loan portfolio of the BAC

№	Groups	PK	KKK	KKI	KKI- PK	Note
1.	X1	26,9	2,1	56,1	+29,2	The risk level is low, the provision for covering overdue debts is sufficient, the interest income is average, the difference is positive
2.	X2	39,2	1,7	66,6	+27,4	The risk level is average, and the overdue debt coverage reserve is average, sufficient for credit investments, the interest yield is lower, the difference is positive

3.	X3	44,8	1,7	77,7	+32,8	The risk level is very low, the provision for repayment of overdue debts is low compared to credit investments, the interest yield is lower than average, the difference is positive.
4.	Loan portfolios	34,9	1,8	64,2	+29,3	The risk of the bank's loan portfolio is generally at an average level. The amount of repayment of overdue debt is sufficient, the amount of interest income is average, and the difference is positive.

Thus, based on the analysis of the Trustbank's loan portfolio based on 5-year indicators, it can be seen that the bank's loan portfolio diversification policy is built correctly. But at the same time, we consider it necessary for H2 to carry out appropriate work to reduce the level of risk in the industries that are part of the cluster. It is important that the Bank pays special attention to the repayment of overdue debts, increases the amount of interest income. In addition, to prevent financial risks affecting banking activities, it is advisable to create a "bank stoex" platform that provides a personalized and personalized experience to bank customers and third-party service users. This platform is important for the diversification of the bank's loan portfolio, reducing the volume of problem loans.

Conclusion: Based on the above analyses, the following conclusions were formulated:

- the bank needs to review the lending limit for the sectors;
- in order to avoid network risks, it is advisable to review the bank's liquidity policy and ensure that there are sufficient funds to cover it;
- it is necessary to avoid problems that arise when establishing a constant information exchange between the bank's credit department and creditors;
- to prevent financial risks affecting banking activities, it is advisable to create a platform "bank stocks", which will provide a personalized and personalized experience to bank customers and third-party service users.

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