

REPUBLIC OF AZERBAIJAN

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**EVALUATION OF THE IMPACT OF EFFECTIVE
PROBLEM LOAN PORTFOLIO MANAGEMENT
ON BANK SUSTAINABILITY**

Speciality: 5301.01 Internal fiscal policy and public finance

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ABSTRACT

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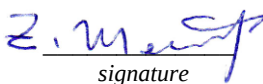


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GENERAL CHARACTERISTICS OF DISSERTATION

Relevance of the topic: Without banks, it is difficult to envisage the patterns of modern economic progress. Banks convert one person's extra funds into an investment for someone else who is in need. This strategy, which appears to be a difficult process outside of banks, is transformed into conventional loan and deposit operations through banks, with many periods cut. Also, we can picture how intricate they are inside the system of relations if we consider that this is only a portion of the labour done by the modern financial system. It is no coincidence that the first signals of the "2008 global financial crisis," which resulted in massive economic losses around the world, appeared in the banking sector. The next global economic crisis, which started in late 2014 with problems in the world's main countries' political relations, has now started to have a severe influence on the banking system. The Azerbaijani economy has been impacted by the global oil market's negative shocks. This crisis has shaken the monetary positions of the country's banks and made their lending portfolios more challenging, resulting in a multi-fold fall in the Central Bank of the Republic of Azerbaijan's strategic foreign exchange reserves. The main cause of Azerbaijani banks' troubles is their lack of financial stability and an insufficient risk management system. Analysis of financial stability indicators of banks operating in Azerbaijan is critical in this regard. Because these indications can help discern the direction of a bank's financial activity and predict the results of its activities, albeit to a limited extent. It is worth noting that a bank's financial stability is directly proportional to the size of its problem loan portfolio. More specifically, a growth in the volume of problem loans lowers the quality of the bank's loan portfolio, and thus its assets, and causes other financial indicators to deteriorate, compromising the bank's financial stability. On the other hand, it should be remembered that loan revenues account for a significant portion of a bank's total revenue. Interest income accounts for two-thirds or more of some Azerbaijani banks' overall revenue. Of this situation, the rise in

problem loans has a negative impact on key bank metrics including profitability and diversity. These issues emphasize the significance of improving banking risk management, particularly credit risk analysis. Considering all of this, we may conclude that the dissertation's topic is highly significant, and the triangle of financial sustainability, problem loans, and risk management is a top priority in banking research.

The level of the study of the problem. Many economists have looked into the issues raised in the study. The study works of A.J. Muradov, E.M.Sadiqov, Z.F.Mammadov, M.M.Baghirov, I.G.Guliyev, Kh.Hasanli, J.A.Abbasov, T.N.Hasanov, A.A.Zulfuqarov, L.Yusifzada, and A.Mammadova have extensively commented on the general theoretical difficulties of the financial and banking systems.

Jurgen F. Conrad, an Asian Development Bank expert, did study in the subject of financial sector analysis in Azerbaijan. His study, titled "Azerbaijan: Financial Sector Assessment," makes some broad generalizations about Azerbaijan's financial system, compares the country's current financial condition to that of other post-Soviet countries, and examines the financial stability indicators of individual institutions.

In addition, foreign scholars in economics including Evren Bolgun, Hasan Jandan, Dr.Alper Ozun, B.B. Beloborodov, Kh.E. Egorova, A.M.Smulov, Altman E., Alfred Hannig, Stefan Jansen, D. Besar, P.Booth, K.K.Chan, A.K.L Milne, and J.Pickles reflected the issues associated with the assessment of loan risks in banks in their scientific works.

The examination of the cited scientific works reveals that, while theoretical risk analysis provisions are generalized in these studies, the influence of loan risks on the amount of problem loans, as well as the impact of problem loans on the banking system's stability, has not been investigated. It is well recognized that the size of a bank's problem loan portfolio has a significant impact on credit risk assessments. In this way, the dissertation might be viewed as a scientific endeavour aiming at closing this gap.

Aims and objectives of the research: The dissertation's major

goal is to examine and research the financial stability of Azerbaijani banks, as well as to evaluate the impact of various macroeconomic factors and external shocks on the amount of problem loan portfolios.

In this approach, the following primary objectives are determined in order to meet the dissertation's goals:

- An examination of the current situation of the problem loan portfolio in Azerbaijani banks, as well as comparisons with other systemically important banks.

- Financial accounts of banks that are significant to the banking system are examined, and the percentage of problem loans in these institutions is calculated.

- Investigate the impact of the Azerbaijani manat's exchange rate on the amount of problem loans, examine the regression relationship between them, use various statistical assessment methods to do so, and to evaluate key econometric models.

- Study the relationship between the dynamics of problem loans in banks and oil revenues in Azerbaijan, conduct a correlation analysis between oil revenues and the country's bank portfolio of problem loans, and calculate the correlation coefficient.

- Collection and preliminary statistical analysis of a number of financial indicators for banks, as well as the calculation of important financial stability indicators.

- Examine the extent to which credit risk forecasting's theoretical and methodological foundations and requirements, which play a critical role in avoiding the rise of issue loan portfolios in banks, are met.

- The impact of the Basel requirements on bank financial stability and problem loans in Azerbaijan's banking sector is examined.

- The creation of a Risk Exposed Value Model for analysing market risks in banks and calculating reserves based on the findings.

- The structure of the Z-quantity model is being organized in order to increase steps to limit the occurrence of credit risks.

Object of research: The dissertation's main objects are portfolio management of problem loans in banks and financial stability analysis of individual institutions.

Subject of research: The dissertation investigates the theoretical

and practical elements of bank financial stability indicators, market risks, and credit risks.

Theoretical and methodological basis of the research: The research's theoretical and methodological foundations are works by local and foreign economists, laws and legislative acts passed by the National Parliament of the Republic of Azerbaijan, and presidential decrees and orders. Also, Special norms within Basel accords, such as Basel Capital Accords and minimum capital based on these accords, universal international requirements in the field of financial stability assistance, activity standards criteria for banks under the names of Basel I, II, and III, as well as the methodology to calculate correlation coefficient, application of the Smallest Squares Method for econometric analysis and econometric analysis with time series show the theoretical significance of the dissertation work.

Logical generalization, comparative and systematic analysis, statistical grouping, correlation, regression, and econometric methods were primarily used in the research.

Information base of the research: The Central Bank of the Republic of Azerbaijan provided data indicators for econometric assessments, the total number of problem loans in the banking system, and figures for the Azerbaijani manat exchange rate. Statistical indicators of non-oil GDP were collected from the Republic of Azerbaijan's State Statistical Committee's website. The statistical indicators needed for the analysis of bank financial stability, which is the dissertation's main focus, were collected from the banks' yearly financial statements, which were approved by external auditors.

The scientific novelty of the research is as follows:

- It was discovered that an increase in the Azerbaijani manat's exchange rate leads to an increase in the percentage of problem loans in the country's banking system, and that an increase in the exchange rate leads to an increase in the percentage of problem loans.

- According to the study, the share of problem loans in total loans has increased as GDP in the non-oil sector has increased. It was discovered that the non-oil sector's GDP and the special weight of problem loans in total loans follow a straight line.

- To evaluate the credit risk model, a number of financial ratios

based on the financial performance of businesses seeking for loans must be calculated and grouped into five characteristics: leverage, liquidity, profitability, coverage, and activity.

- It was determined that banks should “ensure” credit risk using the Z-quantity econometric model. After the financial ratios have been aggregated, a base must be created using the Z-quantity model’s structure.

- Using the analysed model with decision zones, it is necessary to estimate the future bankruptcy of the firm seeking for a loan.

- Each bank is required to complete a Risk Value Analysis for market risks, which is one of the markers of financial stability, as well as the construction of suitable reserves to minimize the consequences of potential market risks.

- Based on an analysis of international experience in the field of problem loans, it was determined that collection agency’ activities in Azerbaijan should be regulated, as well as consumer loan laws should be developed and adopted, and the activities of specialized news agencies such as “credit bureaus” and “loan agencies” should be encouraged. To develop the banking services industry, it is proposed that a financial ombudsman should be established and its actions should be regulated by legislation.

- It has been revealed that Azerbaijan needs to make some reforms in the credit insurance sector. It was discovered that by expanding the number of causes that can be regarded an insured event and make it difficult to repay the debt, banks might avoid expanding their problem loan portfolio.

Theoretical significance of the research: The Z-quantity model presented in the dissertation, as well as the VAR parameter utilized in market risk assessment and the credit-deposit technique, can be used as a theoretical foundation for future study on this topic. Simultaneously, the theoretical aspects of the dissertation’s analyses can be employed in teaching the subject “Financial Risk Management.”

Practical significance of the study: The impact of changes in the Azerbaijani manat’s currency rate, as well as non-oil GDP, on problem loans' share of total loans, as well as the features of the

evaluation of the Z-quantity model that can be used to prevent credit risk in the bank and the creation of a statistical database for this model, can be listed as practical importance of the dissertation work. Furthermore, the risk-weighted average interest rate on loans and deposits for Azerbaijani banks establishes circumstances for the formation of suitable reserves in these banks, which can mitigate the risk of bankruptcy by utilizing the reserves established by the relevant bank in the event of market concerns. These findings, which are discussed at the end of the dissertation, can be applied in practice to reduce the number of problem loans in commercial banks and increase the banking system's financial sustainability.

Approbation and application of results: Relevant scientific proposals containing the dissertation's findings were included in the scientific proceeding of a number of international and national conferences, including the materials of the "Scientific-practical conference of doctoral students and researchers" dedicated to Heydar Aliyev's legacy and the Azerbaijan's sustainable development (Baku, 2015) and the Proceedings of the International Conference titled "Modern problems and trends in economic development, management and computer science in the XXI century" (Sankt Petersburg).

Muganbank Open Joint-Stock Company issued an application certificate stating that the scientific-practical outcomes of the work might be applied.

Materials published as a result of the research. The dissertation's content and findings have been published in 9 scholarly articles and theses in both domestic and international journals.

Volume and structure of the dissertation: The dissertation consists of an introduction (15798 characters), 3 chapters (Chapter I - 66518 characters, Chapter II - 59482 characters, Chapter III - 74085 characters), conclusion (9903 characters), appendix and 135 references. It covers 141 pages (225800 characters), including 7 illustrations, 14 tables, and 1 scheme.

CONTENTS OF THE DISSERTATION WORK

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Chapter I: Theoretical and methodological foundations of problem loan portfolio management's impact on the bank's long-term viability

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The results

References

THE MAIN CONTENT OF THE STUDY

1. The need to manage the portfolio of problem loans

In practice, loans account for more than half of a bank's assets. The most important thing is to make sure the loan is paid back on time and in full. Following the loan's issuance, it can be repaid in one of three ways:

1. Timely and complete fulfilment of obligations by the Borrower

and the Bank;

2. Changing the terms of the contract with the consent of both parties;

3. Transfer of a bank loan to a series of problem loans.

The foundation for the development of the national economy is a stable and efficient financial system. The expansion of the problem loan portfolio poses a threat to the banking system's stability. E.M.Morsman¹ mentions 5 components of the real value of problem loans for the bank:

1. Non-repayment of principal and interest on the loan;

2. Missing opportunities for alternative use of resources;

3. Loan repayment costs;

4. The human aspect - to manage problem loans, banks are required to acquire more experienced personnel. This will take a significant amount of time and money.

5. The presence of a large number of problem loans has a detrimental impact on a bank's reputation.

Problem loans, in any case, have a detrimental impact on the bank's financial health, thus they must be managed. Problem loans are those that have experienced considerable delays in meeting their commitments to the bank, as well as challenges with the borrower's financial situation, collateral quality issues, and losses. Regardless of the quality of the loan portfolio or the credit risk management strategies used, practically all banks encounter loan non-repayment at some point. The problem loan portfolio is an important component of a bank's loan portfolio, and it shows the total amount of problem loans. The rise in bad loans has a negative influence on banks' long-term viability. As a result, bad loans must be managed.

When it comes to addressing troubled loans, banks have two options: the recovery technique and the liquidation method. The borrower and the bank construct a general strategy to repay the debt as part of the recovery method. The technique of recovery may involve mutually agreed-upon fund write-offs, credit restructuring, claim concessions,

¹Морсман Э. М. Кредитный департамент банка: организация эффективной работы // М- 2003, с. 62-63,132,134.

debt sale, and loan refinancing. The liquidation technique entails filing for bankruptcy and selling the borrower's assets to repay the loan. The claim for the mortgaged property, the demand from the loan's guarantors, the repayment of the debt in court, and the beginning of bankruptcy procedures are all examples of liquidation methods.

In the real world, there are two techniques to managing bad loans:

Centralized approach: the state develops special agencies, either inside the Central Bank or for agencies involved in loan restructuring, to receive and manage problem loans.

Decentralized: entails the establishment of problem loan agencies, either within or outside the bank. Collection agencies that deal with the repayment of issue loans are also listed.

2. The current state of problem loans in banks.

According to the study, Azerbaijan's banking system had a strong rate of development and a low percentage of problem loans until 2009. The current crisis is also having a negative impact on the banking sector's development. Problem loans, which are an unavoidable feature of the crisis, must be managed in order to protect banks' interests. The table below shows credit investments in the Azerbaijani economy from 2005 to 2020.

Table 1. Credit investments in the Azerbaijani economy from 2005 to 2020, in million manat

Years	Total	Overdue loans	Special weight of overdue loans %	In national currency		In foreign currency	
				Total	Overdue loans	Total	Overdue loans
2005	1441,0	68,2	4,7	542,9	20,6	898,0	47,6
2006	2362,7	77,7	3,3	1170,5	23,1	1192,2	54,6
2007	4681,8	100,3	2,1	2513,7	44,9	2168,1	55,3
2008	7191,3	159,8	2,2	3672,9	93,2	3518,4	66,6
2009	8407,5	303,5	3,6	4886,2	195,1	3521,3	108,4
2010	9163,4	492,9	5,4	5865,3	342,1	3298,1	150,8
2011	9850,3	633,8	6,4	6326,5	452,1	3523,8	181,7
2012	12243,7	748,8	6,1	8422,8	575,7	3820,9	173,2
2013	15422,9	792,8	5,1	11076,7	627,4	4346,3	165,4
2014	18542,6	976,3	5,3	13505,7	767,6	5037,0	208,8
2015	21730,4	1508,5	6,9	10994,5	840,2	10735,9	668,3
2016	16444,6	1472,6	9	8663,1	682,4	7781,4	790,2
2017	11757,8	1626,7	13,8	6953,6	789,3	4804,2	837,5
2018	13020,3	1585,0	12,1	8073,6	774,1	4946,7	810,9
2019	15298,2	1273,1	8,1	10000,8	702,4	5297,4	570,7
2020	14530,4	893,1	6	10204,0	653,9	4326,4	239,3

Source: <https://www.cbar.az/assets/3577/2.6.pdf>

The growth in the volume of overdue loans in Azerbaijan began in 2009, as seen in the table. In 2009, overdue loans accounted for 3.6 percent of all loans; by 2017, that figure had risen to 13.8 percent and by 2020, it had risen to 6%.

The dissertation examines the financial statements of Azerbaijan's most systemically important banks and compiles data on total loans as well as the percentage of problem loans in total loans.

Table 2.

**Portfolio of problem loans in commercial banks for 2020,
in thousand manats**

	Total loans	Overdue loans	%
International Bank	2547283	961993	3.8
Accessbank	502582	85844	17
Xalq Bank	1488016.02	89693.71	6
Yelo bank	308338.38	100235.99	32.5
Bank Respublika	460158	18678	4
Pasha bank	20555000	39045	1.9
Kapital bank	2175950.66	54430.14	2.5
VTB	243781.83	161470.63	66
Unibank	567313	98149	17
Bank Eurasia	112616.33	24138.17	21.4
On all bank system, in million manats	14530.4	893.1	6.1

Source: The statistical data about banks in the table is derived from the yearly financial statements available on the different institutions' websites. The comprehensive information on the banking system was acquired from the Central Bank of the Republic of Azerbaijan's Statistical Bulletins (see www.cbar.az, publications and surveys, statistical bulletin, December 2020, Table 2.7).

As shown in Table 2, problem loans accounted for 6.1 percent of total loans given to consumers in Azerbaijan's banking sector in 2020. This is a significant quantity, but it does not indicate that the situation is particularly tight. When we compare problem loans by bank, however, we can observe that there are considerable disparities between banks on this metric. Thus, we can observe that the situation in VTB OJSC is more stressful than the banks listed in Table 2 based on the volume of problem loan portfolio. The percentage of bad loans in this bank had climbed to 66% by the end of 2020. In Yelo bank, a similar situation exists. The percentage of problem loans in the bank's

total portfolio grew to 32.5 percent. We can see that Pasha Bank (1.9 percent), Xalq Bank (6%), and Kapital Bank (2.5 percent) are in a stronger position than the essentially important banks shown in Table 2. Loans in foreign currencies, as well as total loans, are in a similar scenario. This means that both internal and external shocks have had a variety of effects on Azerbaijani banks. This suggests that banks' compliance with prudential regulations varies.

In addition, the dissertation examines the gaps in Azerbaijan's problem credit management system. These are some of the shortcomings:

1. Poor quality and non-compliance with the monitoring process.
2. The credit management process is inefficient.
3. In the handling of problem loans, informal methods are preferred.
4. The bank's isolation of troubled loans.
5. Concentrate on the immediate future.
6. Bank management is inefficient.
7. Failure to take into account foreign experience in the administration of problem loans, as well as disparities between Azerbaijan's accounting and management of problem loans.
8. The staff's lack of professionalism and expertise.

3. Analysis of the relationship between the share of problem loans and the exchange rate of the manat.

World oil prices began to decline rapidly in 2013 as a result of the current political scenario. Since the following years, this trend has been accompanied by major challenges in Azerbaijan's balance of payments. Azerbaijan's trade balance (the difference between imports and exports), which is an important part of the country's balance of payments, decreased from 5544 million US dollars in the first quarter of 2014 to 1758 million US dollars in the first quarter of 2015. This shift continued throughout the fourth quarter of 2015; the trade balance was 510 million US dollars. Azerbaijan's trade balance plummeted more than tenfold between 2014 and 2015, despite the fact that it was only a two-year period². With the ensuing rise in world oil prices,

²Statistical bulletins. Central Bank of the Republic of Azerbaijan, Baku.

Azerbaijan's trade balance began to improve, reaching 1589 million USD in the second quarter of 2017. During this time, the global economy's development was unpredictable, and worldwide financial markets' dynamics were volatile. At the same time, economies of both developing and developed countries have slowed down. The depreciation of commodity-exporting countries' national currencies has intensified under these conditions. This scenario has not gone unnoticed by Azerbaijan's banking sector, which has resulted in an increase in the portfolio of problem loans. Prudential regulation and necessary preventive measures aimed at maintaining the banking sector's stability have been in place since 2015. However, no major progress has been made in lowering the proportion of problem loans among total loans.

Figure 1 depicts the exchange rate's evolution over the last decade. From the data, it is obvious that the weight of problem loans and the exchange rate follow a nearly straight line. In other words, an increase in the exchange rate, and thus an increase in the amount of problem loans, will be accompanied by an increase in the value of the US dollar versus the manat.

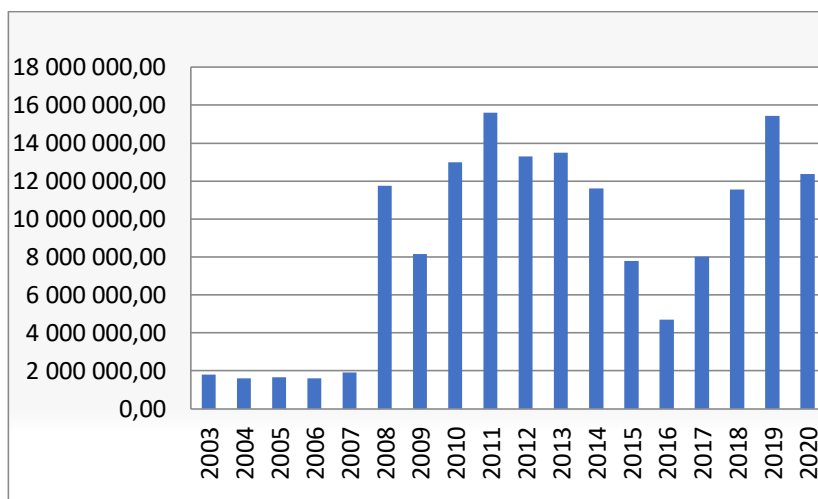


Figure 1. Exchange rate of Azerbaijani manat against US dollar, AZN / USD

Source: Central Bank of the Republic of Azerbaijan (www.cbar.az)

This finding was accurately analysed in the dissertation by calculating a statistical measure known as the **correlation coefficient**. The correlation coefficient can be used to identify whether or not two variables have a linear relationship or to analyse the sort of linear relationship. The range of values for this coefficient is [-1; 1]. A correlation coefficient +1 shows that there is a linear relationship between the two variables. It means that increasing one of these variables leads the other to rise. No, if the correlation coefficient is -1, we can argue that these variables have an inverse linear connection. It means that increasing one of these variables causes the other to decrease.

Table 3. Calculation of the correlation coefficient between the share of problem loans on total loans and the exchange rate of manat

n (years)	y	X	$(y - \bar{y})^2$	$(x - \bar{x})^2$	$(x - \bar{x})(y - \bar{y})$
2003	0.19	0.9821	0.0144	0.012	0.0002
2004	0.11	0.9827	0.0016	0.012	0.0002
2005	0.05	0.9459	0.0004	0.0212	0.00000848
2006	0.03	0.8927	0.0016	0.0396	0.000063
2007	0.02	0.8579	0.0025	0.0547	0.0001
2008	0.02	0.8216	0.0025	0.073	0.0002
2009	0.04	0.8038	0.0009	0.0829	0.00007
2010	0.05	0.8026	0.0004	0.0836	0.000033
2011	0.06	0.7879	0.0001	0.0923	0.000009
2012	0.06	0.7856	0.0001	0.0937	0.000009
2013	0.05	0.7845	0.0004	0.0944	0.000038
2014	0.05	0.7844	0.0004	0.0945	0.000038
2015	0.07	1.0261	0.0000	0.0043	0.00000
2016	0.09	1.5959	0.0004	0.2541	0.0001
2017	0.138	1.7000	0.0046	0.3699	0.0017
2018	0.121	1.7000	0.0026	0.3699	0.00096
2019	0.08	1.7000	0.0001	0.3699	0.000037
2020	0.06	1.7000	0.0001	0.3699	0.000037
	$\bar{y} = \frac{\sum y}{18} = 0.07$	$\bar{x} = \frac{\sum x}{18} = 1.0918$	$\sum_{i=1}^{18} (y_i - \bar{y})^2 = 0.001$	$\sum_{i=1}^{18} (x_i - \bar{x})^2 = 0.1384$	$\sum_{i=1}^{18} (x_i - \bar{x})(y_i - \bar{y}) = 0.0038$

Source: Central Bank of the Republic of Azerbaijan (www.cbar.az)

y= Share of problem loans on total loans, in% (Source: Central Bank of the Republic of Azerbaijan, statistical bulletins, table 2.7)

x = Exchange rate of Azerbaijani manat (source: Central Bank of the Republic of Azerbaijan,

$$\begin{aligned}
 S_y &= \sqrt{\frac{\sum_{i=1}^{18} (y_i - \bar{y})^2}{17}} = \sqrt{\frac{0.001}{17}} = 0.008 \\
 S_x &= \sqrt{\frac{\sum_{i=1}^{18} (x_i - \bar{x})^2}{17}} = \sqrt{\frac{0.1384}{17}} = 0.09 \\
 cov(x, y) &= \frac{0.0038}{17} = 0.0002 \\
 r_{xy} &= \frac{cov(x, y)}{S_y S_x} = \frac{0.0002}{0.008 * 0.09} = 0.30
 \end{aligned}$$

The correlation coefficient between the weight of problem loans on total loans and the exchange rate of the Azerbaijani manat was found to be 0.30 in the dissertation. This estimated ratio revealed that these economic variables had a positive link. However, it is impossible to say that there is a straight line between them based on this coefficient. The computed correlation coefficient required to be close to 1 for this to work. It was discovered that as the exchange rate rises, so does the percentage of problem loans. There is no non-linearity in this positive contact. We conducted *regression analysis* to see how the rise in the Azerbaijani mana's exchange rate affected the rise in the weight of problem loans. The following is an econometric model for measuring the impact of the manat exchange rate on the number of problem loans in the country's banking sector:

$$\Delta \ln(y_t) = b_0 + b_1 * \Delta \ln(x_t) + b_2 * \Delta \ln(z_t) + u_t$$

The regression model was evaluated by the *smallest squares method* using the Eviews software package. The results of the assessment are given below:

$$\begin{aligned}
 \Delta \ln(y_t) &= -0.42 + 1.27 * \Delta \ln(x_t) + 2.30 * \Delta \ln(z_t) + u_t \\
 (0.048) \quad (0.033) \quad (0.029)
 \end{aligned}$$

As a result, it was discovered in this chapter that a 1% increase in the Azerbaijani manat exchange rate results in a 1.27 percent increase in the percentage of problem loans in the country's banking sector. To be more specific, a 1% increase in the exchange rate, such as from 0.7800 to 0.7878, results in an increase in the share of problem loans, such as from 0.5 to 0.5064 (0.5 + 0.5 * 1.27%). According to the findings, a 1% increase in non-oil GDP is associated with an increase in the proportion

of problem loans in total loans. As a result, for the assessment period, a 1% rise in non-oil GDP increases the weight of problem loans in total loans by 2.3 percent. In the explanation of this outcome, some interesting points surfaced. The demand for bank loans rises in tandem with the expansion of non-oil GDP. Alternatively, non-oil GDP producers employ loans to expand output, which leads to an increase in credit and a parallel development of non-oil GDP. It is fascinating to consider the relationship between non-oil GDP and the proportion of problem loans in overall loans. As is well known, the created product is included in the GDP if it is sold on the market. As a result, the direct relationship between the amount of problem loans and non-oil GDP can be explained by partners' failure to pay for products produced and sold on time, resulting in producers' inability to return their loans on time. At the same time, it is reasonable to suppose that the majority of these partners were more affected by negative oil price shocks, which resulted in some difficulty paying for the items they purchased.

4. Credit risk forecasting to reduce the volume of problem loans.

Credit risk is one of the factors contributing to the rise in problem loans. Credit risk emerges when a borrower is unable to satisfy its commitments for a variety of reasons. Credit risk prevention can help to reduce such problem loans in this regard. In addition to the borrower's current circumstances while issuing a loan, credit risk prevention necessitates an examination of the loan's future performance. The Z-quantity model proposed by Altman in 1968, widely used in loan risk forecasting, is given below³.

$$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 0.999 X_5$$

Here, X_1 = Working capital / Total assets

X_2 = Income after dividend payment / Total assets

X_3 = Income before tax and interest expenses / Total assets

X_4 = Market value of assets / Total liabilities

X_5 = Sales / Total assets

Decision-making zones:

³Altman E. Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy // The Journal of Finance, Vol. 23, No. 4, 1968, pp. 589-609.

$Z > 2.99$ - “reliable” zone;
 $1.81 < Z < 2.99$ - “green” zone;
 $Z < 1.81$ - “default” zone.

The given Z model defines a certain quantity Z based on the relevant values of business financial ratios, which of these quantities falls into the zone of differentiation, allowing for the prediction of the enterprise’s future condition. If the computed quantity of Z falls into the “reliable” zone, the firm's future activity can be regarded dependable as well, and lending to such an enterprise could help to limit the build-up of problem loans. If the computed amount of Z falls into the “green” zone, it is impossible to predict how such businesses will operate in the future, and more research is needed. If an enterprise’s Z value goes into the “default” zone, the enterprise’s future activity is in doubt, and lending to such businesses is a source of possible credit risk, which will indirectly raise the volume of problem loans.

To evaluate the credit risk model, banks must calculate a number of financial measures based on the financial performance of businesses that have applied for loans and categorize them into five categories: leverage, liquidity, profitability, coverage, and activity. After grouping the financial ratios for these five qualities, the base should be built using the Z-quantity model’s structure. In this scenario, the value of Z is set to 0 for businesses who received a loan from the bank and then went bankrupt (and so were unable to return the loan due to their bankruptcy, resulting in an increase in the bank’s problem loan share), and 1 for businesses that are active (which repaid the loan on time). Decision zones should be used to anticipate the bankruptcy of a company seeking for a loan using the assessed model. If this enterprise’s Z value is greater than the computed crucial value of Z, the bank may consider this enterprise to be a future-oriented business and lend to it. This risk analysis will avoid the bank from becoming overburdened with issue loans.

5. Directions to increase financial stability in banks.

The dissertation looks at the key steps taken to minimize problem loans, as well as strategies to increase the efficiency of problem loan portfolio management in the context of banking system stability regulation. In addition, financial stability metrics for banks that are

essential to multiple systems were examined, with the results provided in the table below.

Table 4. Indicators of financial stability in banks, in %

	Kapital bank	International Bank of Azerbaijan	Bank Eurasia	Access bank	Pasha bank
Authorized capital / risk-weighted assets	10.2%	25.4%	46.7%	46.6%	14.9%
Tier I capital adequacy ratio (norm-5%)	11.4%	32.9%	63.8%	8.7%	16.1%
Total capital adequacy ratio (norm-10%)	23.8%	35.1%	65%	14.2%	21.7%
Provisions for overdue loans / Capital	5.2%	19.5%	22.8%	55.3%	10.2%
Overdue loans / Total loans	2.5%	3.8%	21.4%	17%	1.9%
Return on assets	5.8%	2.6%	1.13%	0.3%	2.8%
Return on capital	55.3%	14.2%	25.6%	3.3%	33.5%
Interest income / Total income	67%	74%	88%	91%	79%
Non-interest income / Total income	33%	26%	12%	9%	21%
Liquid assets / Total assets	58.4%	64.6%	35.1%	28.4%	54%
Net open position in foreign currency / Capital	0%	0.89%	4.26%	10%	- 45.8%

Source: The statistical data on banks included in the table was compiled by the author from annual financial statements published on the websites of the relevant institutions.

Table 4 shows that the ratio of authorized capital to assets measured by risk level for Kapital bank, International Bank of Azerbaijan (IBA), and Pasha bank is not lower than the norms. This demonstrates that these banks' investments in terms of authorized capital meet the requirements. The conditions are not met by Accesbank and Bank Eurasia. The aggregate capital adequacy ratio, which is defined as the ratio of aggregate capital to risk-weighted assets, encompassing losses from prior years and current years, is economically significant. When looking at these indicators for the banks listed in Table 4, the best indicators can be found in Bank Eurasia (65%), International Bank (35.1%), Kapital Bank (23.8%), Pasha Bank (21.7%), while the most negative indicators can be found in Accessbank (14.2%). On outstanding loans, Accessbank's Reserves / Capital ratio is 55.3 percent, whereas Bank Eurasia's is 22.8 percent.

This means that the financial indicators are primarily concerned with the expenditures of the loan portfolio's reserve fund. This is demonstrated by the fact that late loans account for 17% of Accessbank's overall portfolio and 21.4 percent of Bank Eurasia's. The statistics show that, while Accessbank's share of overdue loans in the total portfolio is lower than Bank Eurasia's, and the structural quality of its loan portfolio is poorer, because Accessbank's reserves on past-due loans had a 55.3 percent reserve-to-capital ratio. This is because the bank's loan portfolio was deemed hazardous, prompting it to boost its reserve capital.

The ratio of interest income to total income, as well as the ratio of non-interest income to total income, shows that return on assets in Accessbank (91%) and Bank Eurasia (88%) is more concentrated on interest income, whereas return on assets in International Bank (74%), Pasha bank (79%), and Kapital bank (67%) is relatively better diversified. Thus, it can be stated that the International Bank, Pasha Bank, and Kapital Bank have superior financial stability than Accessbank and Bank Eurasia in the event of unfavorable changes in market interest rates and worsening loan quality. The ratio of liquid assets to total assets of Accessbank and Bank Eurasia is inadequate. This suggests that the situation in the banks mentioned in the scenario where some depositors seek for a loan may deteriorate.

We can conclude that Kapital Bank, International Bank, and Pasha Bank have stronger financial stability based on an analysis of all financial stability indicators. It is worth noting that this type of study can be performed on any bank. However, due to problems in gathering financial indicators, all essentially important institutions could not be included in the research. However, we believe that the banks examined will be sufficient to construct an overall picture, given they account for a large portion of Azerbaijan's banking sector.

6. Assessment market risks and create necessary reserves to ensure financial stability in banks.

Financial indicators, unlike other types of financial indicators, cannot be used to gauge market risks and set adequate reserves. In order to accomplish this, the dissertation included risk analysis and risk models. The Value at Risk (VAR) is the major guiding tool in the

management of market risks in banks, according to the dissertation. Unexpected losses can be quantified and risk mitigation measures adopted in this manner. The VAR used to calculate market risks is calculated using the following equation.

$$VAR = Z\sigma\sqrt{t}V$$

Here, VAR – the value at risk Z- statistical value in the pre-accepted confidence interval, σ - daily standard error of the risk factor, t - retention time, V- is the value of the portfolio (In the dissertation, this will be the gap between bank loans and deposits).

As seen in Table 6, most Azerbaijani banks had negative balances at the end of 2020, as deposits surpassed loans. IBA, Bank VTB, Bank BTB, Yelobank, and Premium OJSC, on the other hand, received favourable results from these banks. This means that by the end of 2020, these banks' loans will have overtaken their deposits. When calculating the Value at Risk for IBA, Bank VTB, Bank BTB, Yelobank, Premium OJSC, we utilized the daily standard error of the average interest rate on loans in manat as a risk factor.

Table 5. Balance between loan and deposit portfolio in banks, in million manats

N	Name of Bank	Loans	Deposits	Gap
1	ABB	2547.283	5460.956	2913.673
2	Kapital Bank	2186.376	3805.619	-1619.243
3	Accessbank	502.582	760.030	-257.448
4	Unibank	567.000	708.000	-141
5	Bank Respublika	460.158	689.627	-229.469
6	Muğanbank	324.515	476.774	-152.259
7	Yelo bank	308.33838	235.15871	73.180
8	Turan bank	326.700	462.800	-136.1
9	YapiKredi Bank	125.683	249.563	-123.88
10	Rabitə bank	423.332	546.172	-122.84
11	Bank VTB (AZ)	125.86984	75.30508	50.565
12	Bank BTB	226.372	140.193	86.179
13	Azer-Turk Bank	160.248	290.878	-130.63
14	Baku branch of National Bank of Iran	5.22183	10.703	-5.481
15	Ziraat Bank Azerbaijan	154.913	195.982	-41.069
16	XALQ Bank OJSC	1488.01602	1652.43005	-164.414
17	Premium OJSC	564.465	431.118	133.347
18	Bank Eurasia OJSC	112.61633	310.40644	-197.79011
19	Pasha Bank OJSC	2608.818	4091.379	-1482.561

19 Pasha Bank ASC 2608.818 4091.379 -1482.561

Source: Table compiled by the author using the annual financial statements of commercial banks for 2020.

In other banks, the daily standard error of the average interest rate on manat deposits was used as a risk factor to calculate the VAR, as the coin is negative, meaning that deposits exceed loans. Thus, after performing a basket analysis on loans and deposits, the VAR was calculated. For a more understandable and systematic nature of the calculation, the calculation of the VAR for 19 banks is shown in Table 6.

Table 6: VAR at Azerbaijani Banks, in million manats

N	Name of Bank	Gap (V) = loan - deposits	Gap (V) = deposits - loans	VAR
1	IBA	2913.673		1805.9
2	Kapital Bank		-1619.243	963.4
3	Accessbank		-257.448	153.1
4	Unibank		-141	83.8
5	Bank Respublika		-229.469	136.5
6	Muğan bank		-152.259	90.5
7	Yelo bank	73.180		45.4
8	Turan bank		-136.1	80.9
9	YapıKredi Bank		-123.88	73.7
10	Rabitabank		-122.84	73.09
11	Bank VTB (AZ)	50.565		31.34
12	Bank BTB	86.179		53.4
13	Azer-Turk Bank		-130.63	77.7
14	Azerbaijan branch of the National Bank of Iran		-548.1	326
15	Ziraat Bank Azerbaijan		-41.069	24.5
16	XALQ Bank OJSC		-164.414	97.8
17	Premium OJSC	133.347		82.6
18	Bank Eurasia OJSC		-197.79011	117.7
19	Pasha Bank OJSC		-1482.561	882.1

Source: Table was compiled by the author using the annual financial statements of commercial banks for 2020.

Note that $Z = 1.96$ is used for computing RMD. This standard is derived from the crucial table of normal distribution (Z) at a 95% level of significance. We use $= 0.096$ for the deposit-credit difference and $= 0.10$ for the credit-deposit difference in this formula. Because the loan-deposit and deposit-credit difference (penny) are expected to be acquired in 10 days, $t = 10$.

Table 6 shows that the IBA has a risk value of 1805.9 million manat. This suggests that there's a 95% chance that the highest unexpected loss of IBA interest-bearing assets and liabilities (loans and deposits) as a result of the average interest rate on loans moving downward or upward in the next 10 days will be 1805.9 million manats. In the next 10 days, there is a 5% chance that this loss will

exceed 1805.9 million manats. Other banks could be subjected to a similar trial. It should be highlighted that each bank's VAR represents a loss caused solely by changes in the average interest rate on loans and deposits.

The author used the ratio of Value at Risk estimated for each bank to the total capital of banks in the dissertation to build a more detailed picture of bank financial stability. Table 7 contains these indicators.

Table 7: Value at Risk Ratio to Total Capital Calculated by Banks

N	Name of the bank	VAR	Capital	VAR / Capital
1	IBA	1805.9	1712.908	1.05
2	Kapital Bank	963.4	634.195	1.51
3	Accessbank	153.1	79252.77	1.93
4	Unibank	83.8	96.766	0.9
5	Bank Respublika	136.5	79.107	1.7
6	Mugan bank	90.5	37.5	2.41
7	Yelo bank	45.4	58.16	0.8
8	Turan bank	80.9	55.8	1.5
9	YapiKredi Bank	73.7	55.381	1.3
10	Rabitabank	73.09	98.7	0.74
11	Bank VTB (AZ)	31.34	60.292	0.51
12	Bank BTB	53.4	62.694	0.9
13	Azer-Turk Bank	77.7	52.013	1.5
14	Azerbaijan branch of the National Bank of Iran	326	37.378783	8.7
15	Ziraat Bank Azerbaijan	24.5	69.87	0.35
16	XALQ Bankı OJSC	97.8	414.012	0.23
17	Premium OJSC	82.6	127.967	0.64
18	Bank Eurasia OJSC	117.7	70.22506	1.67
19	Pasha Bank OJSC	882.1	541.145	1.63

Source: The statistical information on banks given in the table is collected from the annual financial statements provided on the websites of the respective banks.

Table 7 compares each bank's VAR at the end of 2020 to its total capital for the year. This indicator, as can be seen, differs from bank to bank and provides more detailed information about a bank's financial stability. At the end of 2020, the assessed VAR for a 10-day period in Mugan Bank was about twice the total capital, and more than 8 times in the National Bank of Iran's Baku branch. Based on this analysis, it can be determined that these banks' financial stability is poor. The greatest performers are Ziraat Bank Azerbaijan and Xalq Bank, while

the banks with moderately decent performance include Unibank OJSC, Premium OJSC, and Yelo Bank. As a result, the risk factor was used to analyze market risks for most banks in Azerbaijan, as well as the necessary reserves to be built to reduce the consequences of this risk. The statistical sequence of average interest rates on loans and manat deposits was investigated for this purpose, and it was found that these statistical indicators have a normal distribution from January 2005 to December 2020. Then, due to the average interest rate risk factor on loans and deposits, the Value at Risk (VAR) of unanticipated losses of interest-bearing assets and liabilities (difference between loans and deposits) was calculated. Based on this approach, banks can easily generate an appropriate reserve fund and remove the consequences of potential market risks, thereby improving the bank's financial stability and, as a result, the financial stability of the entire banking system.

The main provisions of the dissertation are reflected in the following works of the author.

1. "Müasir şəraitdə iqtisadiyyatın modernləşməsində kommersiya banklarında kredit portfelinin idarə olunması problemləri", Azərbaycanda iqtisadiyyatın modernləşməsi prosesinin dövlət tənzimlənməsi, Bakı 2018, səh.277-293
2. Allahverdiyeva A. Banklarda problemli kreditlərin həcmnin azaldılması üçün həyata keçirilən tədbirlər / "İqtisad elminin müasir problemləri" mövzusunda keçirilən Respublika elmi-praktiki konfransı, 2018
3. Аллахвердиева А. Оценка текущего состояния портфеля проблемных кредитов в банковской системе Азербайджана // ФЭС: Финансы. Экономика. Стратегия, N 11, 2017.
4. Allahverdiyeva A. Müasir şəraitdə bank sisteminin dayanıqlılığına təsir göstərən amillər // AMEA elmi əsərlər toplusu, N 4, 2017, s.159-166.
5. Allahverdiyeva A. Problemli kreditlər portfelinin idarə edilməsinin iqtisadi əsasları // Odlar yurdu universitetinin elmi və pedoqoji xəbərləri, N 46, 2017, s. 114-119.
6. Allahverdiyeva A. Banklarda problemli kreditlər portfelinin idarə edilməsinin təkmilləşdirilməsi // Audit jurnalı, cild 18, N 4, 2017, s. 31-41.

7. Аллаxвердиева А. Международный опыт в области управления кредитным портфелем и особенности его применения в Азербайджане / Современные проблемы и тенденции развития экономики, управления и информатики в XXI веке, сборник научных статей по материалам научно-практической конференции с международным участием, Санкт- Петербург 2016, стр. 217-220.
8. Allahverdiyeva A. Kommersiya banklarında problemli kreditlərin artma səbəbləri // Azərbaycanın vergi jurnalı, 1(127)/2016, s. 175-186.
9. Allahverdiyeva A. Kommersiya banklarında problemli kreditlərin geri qaytarılmasının həlli yolları / Heydər Əliyev irsi və Azərbaycan Respublikasının davamlı inkişafı mövzusunda doktorant və dissertantların elmi-praktiki konfransının materialları, s. 91-97, Bakı, 2015.



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