UDC 519.86
JEL Classification: C32; E51; E52; G21

THE RELATIONSHIP BETWEEN ECONOMIC GROWTH, DISCOUNT RATE, AND CREDITS IN THE REPUBLIC OF AZERBAIJAN: EMPIRICAL EVIDENCE FROM ARDL APPROACHES

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The Relationship Between Economic Growth, Discount Rate, and Credits in the Republic of Azerbaijan: Empirical Evidence from ARDL Approaches

This article examines the relationship between bank credit, real gross domestic product (GDP), and the Central Bank's discount rate in the Republic of Azerbaijan over the period from the first quarter of 2005 to the fourth quarter of 2024. The study is grounded in the theoretical framework of the monetary transmission mechanism, with particular emphasis on the credit channel, and aims to determine whether credit market dynamics are primarily driven by real economic activity or by monetary policy conditions. The stationarity of the variables was examined using unit root tests, which revealed different orders of integration among the series. Accordingly, the ARDL approach was employed to investigate long-run and short-run relationships through bounds testing and the Error Correction Model (ECM), while diagnostic and causality tests were conducted to assess model adequacy and causal linkages. The empirical findings confirm the existence of a statistically significant long-run cointegration relationship between bank credit, economic growth, and the discount rate. Real GDP exerts a positive and significant effect on credit expansion, suggesting that improvements in economic activity stimulate credit demand and support lending growth. In contrast, the discount rate has a negative impact on credit volumes, indicating that tighter monetary policy conditions constrain borrowing and reduce credit market activity. The findings contribute to the literature on credit market development in emerging economies and provide new empirical evidence regarding the determinants of bank lending in Azerbaijan. The results also offer policy implications for monetary authorities seeking to balance financial stability objectives with sustainable credit market development and long-term economic growth.

Keywords: *bank lending; monetary policy; real sector; cointegration analysis; error correction model; time series analysis.*

DOI: *https://doi.org/10.32983/2222-0712-2026-2-379-390*

Fig.: *4.* ***Tabl.:*** *8.* ***Formulae:*** *4.* ***Bibl.:*** *29.*

Babazade Govher Shakir *– Candidate on Doctor Degree of the Department of Mathematical Economics, Baku State University (23 Academician Zahid Khalilova Str., Baku, AZ1148, Azerbaijan)*

E-mail: *govher.babazade@gmail.com*

ORCID: *https://orcid.org/0009-0005-6871-635X*

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JEL Classification: C32; E51; E52; G21

Бабазаде Г. Ш. Взаємозв'язок між економічним зростанням, обліковою ставкою і кредитуванням в Азербайджанській Республіці: емпіричні дані на основі ARDL-підходу

У статті досліджено взаємозв'язок між банківським кредитуванням, реальним валовим внутрішнім продуктом (ВВП) та обліковою ставкою Національного банку Азербайджану за період з І кварталу 2005 р. до IV кварталу 2024 р. Дослідження базується на теоретичних положеннях механізму монетарної трансмісії з акцентом на кредитному каналі та спрямоване на визначення того, чи динаміка кредитного ринку переважно зумовлена реальною економічною активністю, чи умовами монетарної політики. Стаціонарність змінних перевірено за допомогою тестів на одиничний корінь, результати яких засвідчили різні порядки інтеграції часових рядів. У зв'язку з цим для дослідження довгострокових і короткострокових взаємозв'язків застосовано модель авторегресії з розподіленими лагами (ARDL), тест меж (Bounds Test) і модель корекції помилки (ECM). Для оцінки адекватності моделі та причинно-наслідкових зв'язків проведено діагностичні тести і тестування причинності. Емпіричні результати підтверджують існування статистично значущого довгострокового коінтеграційного зв'язку між банківським кредитуванням, економічним зростанням та обліковою ставкою. Реальний ВВП чинить позитивний і статистично значущий вплив на розширення кредитування, що свідчить про стимулюючий вплив економічної активності на попит на кредити та зростання обсягів банківського кредитування. Водночас облікова ставка має негативний вплив на обсяги кредитування, що вказує на стримувальний ефект жорсткішої монетарної політики щодо кредитної активності. Отримані результати роблять внесок у розвиток досліджень кредитного ринку у країнах з економікою, що розвивається, та надають нові емпіричні докази щодо детермінант банківського кредитування в Азербайджані. Практичне значення дослідження полягає у можливості використання його результатів органами монетарної влади для забезпечення балансу між фінансовою стабільністю, сталим розвитком кредитного ринку та довгостроковим економічним зростанням.

Ключові слова: *банківське кредитування; монетарна політика; реальний сектор; коінтеграційний аналіз; модель корекції помилки; аналіз часових рядів.*

Рис.: *4.* ***Табл.:*** *8.* ***Формул:*** *4.* ***Бібл.:*** *29.*

Бабазаде Говхер Шакір кизи *– докторант кафедри математичної економіки, Бакинський державний університет (вул. Академіка Західа Халілова, 23, Баку, AZ1148, Азербайджан)*

E-mail: *govher.babazade@gmail.com*

ORCID: *https://orcid.org/0009-0005-6871-635X*

Introduction. In the modern macroeconomic system, the credit market is not merely confined to the function of financial intermediation; rather, it acts as an endogenous mechanism playing an active role in shaping economic dynamics. In this regard, credit dynamics are formed through the interaction between real economic activity and monetary policy instruments. Viewed from this perspective, the primary analytical challenge lies in identifying the source of credit market dynamics. In other words, is credit volatility primarily explained by demand impulses generated by the real sector, or by financial conditions determined by monetary policy? This question serves as a fundamental theoretical and empirical problem that determines not only the direction of interrelationships between macroeconomic variables but also the efficiency of the monetary transmission mechanism.

Based on the established theoretical framework, this study aims to evaluate the dependence of the credit portfolio on GDP and the Central Bank's discount rate in the context of the Azerbaijani economy using an econometric approach, thereby identifying the formation mechanism of the credit market. To this end, the following hypotheses are proposed:

- H1: GDP has a positive and statistically significant long-term impact on the credit portfolio.
- H2: The discount rate exerts a negative and statistically significant long-term effect on the credit portfolio.
- H3: Credit market dynamics are shaped under the joint influence of short-term and long-term components.
- H4: The causal relationship is primarily directed from economic activity toward credits.

Consequently, by evaluating the functional role and structural interaction mechanisms of the credit market within the macroeconomic system through a dynamic econometric framework, this research aims to bridge the existing empirical gap and contribute to a deeper understanding of the monetary transmission mechanism.

Analysis of the credit market state and the mutual dynamics of GDP and the discount rate. An analysis of the development trajectory of the Azerbaijani economy covering 2005–2024 indicates that the lending activity of the banking sector has evolved in close correlation with the dynamics of nominal GDP. During this period, shifts in the credit portfolio clearly mirrored the key developmental stages of the economy.

The high economic growth observed between 2005 and 2014, characterized by nominal GDP expansion and increased liquidity in the banking sector, facilitated rapid credit portfolio growth. As a result, the Credit-to-GDP ratio rose to 31.4% by 2014. However, against the backdrop of external shocks and devaluation during 2015–2017, the credit market experienced a contraction, leading to a decline in the credit portfolio and a drop in the financial depth indicator to 16.8%. Since 2020, the recovery of economic activity has triggered a resurgence in lending, with the credit portfolio reaching AZN 29.3 billion in 2024.

Observations over the analyzed period show that the discount rate has functioned as both a restrictive and a stimulative tool in the credit market. For instance, despite the discount rate increasing from 7.0% to 15.0% during the 2005–2008 economic boom and rising inflationary pressures, high economic activity drove the credit portfolio from AZN 1.4 billion to AZN 7.2 billion. Conversely, the sharp increase in the discount rate amid external shocks and devaluation in 2015–2017 was accompanied by a market contraction, with the portfolio shrinking from AZN 21.7 billion to AZN 11.8 billion. The easing of monetary policy and the reduction of the discount rate in the post-2020 phase supported the recovery of lending activity, leading to the aforementioned increase in 2024.

The dynamics of the credit-to-GDP ratio, which characterizes the level of financial deepening, are also of particular significance. This indicator, which stood at 11.2% in 2005, peaked at 39.9% during the 2015 economic cycle. Following the banking sector restructuring phase, the ratio stabilized at 23.2% by the end of 2024. This suggests that financial intermediation has transitioned from a post-crisis recovery phase toward a more sustainable development stage.

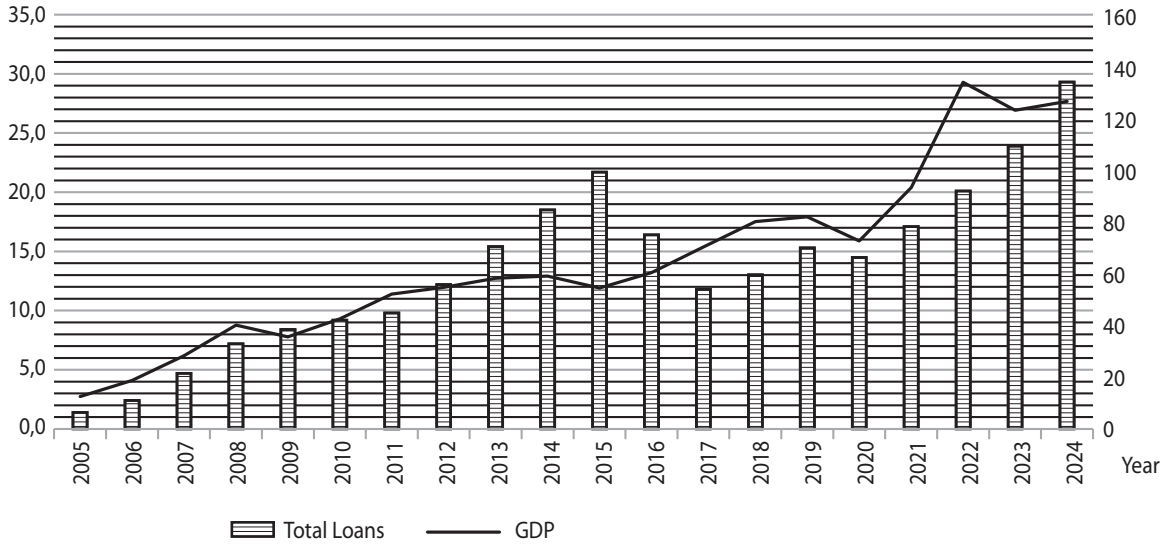

Fig. 1. Comparative dynamics of the credit portfolio and GDP

Source: developed by the author

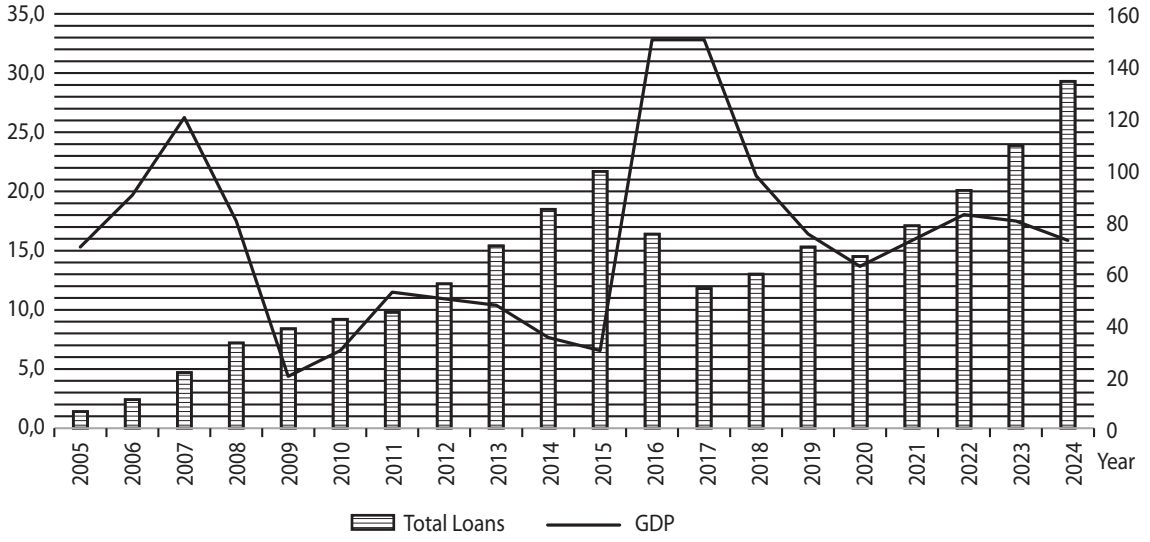

Fig. 2. Response of the credit portfolio to changes in the discount rate

Source: developed by the author

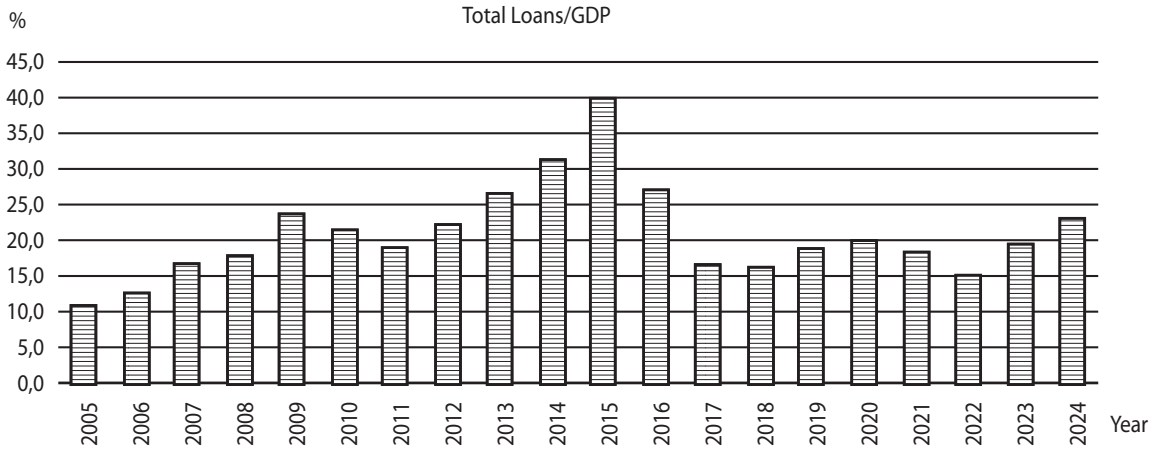

Fig. 3. Twenty-year evolution of financial deepening: credit-to-GDP ratio

Source: developed by the author

Literature review. In modern economic theories, the credit market is regarded not merely as a technical element of financial intermediation but as a crucial transmission mechanism that facilitates interaction between real economic activity and monetary policy. Particularly in economies dominated by the banking sector, credit dynamics hold strategic importance for financing economic growth, stimulating investment activity, and channeling monetary policy to the real sector. Consequently, investigating the macroeconomic determinants of the credit market has become a primary research direction in economic literature in recent years.

One of the fundamental studies explaining the role of the credit channel within the framework of the monetary transmission mechanism belongs to Bernanke and Gertler [3]. The authors demonstrate that the Central Bank's interest rate policy influences real economic processes not only through the money supply but also through the lending behavior of banks. Furthermore, Kashyap and Stein [14] analyzed the sensitivity of bank balance sheets to monetary policy changes, emphasizing that the credit channel functions more robustly, especially in bank-based financial systems.

The interrelationship between the credit market and economic growth has been extensively explored in empirical studies across various countries. Calza et al. [5] determined that the primary determinants of private sector credit demand in the Eurozone are linked to economic activity and interest rates. Égert et al. [8] noted that credit expansion takes on a more intensive character during periods of rapid economic transformation in Central and Eastern European countries.

Research conducted on the Ukrainian economy specifically highlights that the credit market takes shape under conditions of macroeconomic instability. Dubyna et al. [7] found that macroeconomic crises and currency shocks have weakened the development of the credit market and constrained the recovery of bank lending. Talavera et al. [27] empirically substantiated that macroeconomic uncertainty exerts a negative impact on bank credits. Meanwhile, Mishchenko et al. [17], evaluating the effectiveness of the monetary transmission mechanism in

Ukraine, showed that while the interest rate channel functions, the credit channel remains not fully effective due to a weak institutional environment.

Studies on the Azerbaijani economy also indicate that the credit market is closely linked to economic growth. Hasanov and Huseynov [10] identified a long-term positive relationship between bank credits and non-oil economic growth. The authors noted that credits stimulate the expansion of the real sector and play a vital role in the development of the non-oil sector. Zeynalova [24] analyzed the interconnections between credit volume, money supply, and economic growth, demonstrating that the credit market is systematically linked to monetary variables. Alizade [1] analyzed the long-term relationships between GDP growth rates in the Republic of Azerbaijan and Ukraine, emphasizing the interdependence of macroeconomic indicators in post-Soviet economies. Aliyev et al. [2] highlighted that Azerbaijan, as a small open economy, is sensitive to monetary policy changes and noted that interest rate policy has a significant impact on economic activity.

While a significant portion of existing research primarily investigates the impact of credits on economic growth, the sources and drivers of credit market formation remain relatively under-researched. Specifically, there is limited research regarding a comprehensive assessment of the short- and long-term interactions between credit volume, GDP, and the Central Bank's discount rate in the Azerbaijani economy. In this context, this study is directed toward determining the impact of economic activity and monetary policy indicators on the dynamics of the credit market in Azerbaijan.

Data and model specification. In the empirical analysis, the banking sector's loan portfolio acts as a dependent variable. In order to determine the interaction of loans with economic activity and interest rate policy, nominal GDP and the Central Bank's discount rate were included in the model as the main explanatory variables.

The theoretical basis of the study is based on the monetary transmission mechanism and one of its important components, the credit channel approach. According to the monetary transmission mechanism, the monetary policy implemented by the central bank through interest rates is transmitted to the financial system and affects real economic variables [18].

At the same time, the formation of the credit market is closely related not only to supply-side factors, but also to the dynamics of the real sector. In this regard, the study took into account the demand approach to credit. According to the relevant approach, GDP growth, which is the main indicator of economic activity, leads to an expansion of investment and consumption demand, which increases the demand for financial resources, especially bank loans [5; 8].

In accordance with this theoretical framework, the model is initially expressed in the following functional form:

$$LN\_LOANS = f(LN\_GDP, IR). \quad (1)$$

This functional dependence is then specified as an econometric model as follows:

$$LN\_LOANS_t = \beta_0 + \beta_1 LN\_GDP_t + \beta_2 IR_t + \varepsilon_t. \quad (2)$$

Here, LN_LOANS denotes the natural logarithm of the volume of loans, LN_GDP denotes the natural logarithm of real GDP, and IR denotes the Central Bank's discount rate. Including the loan and GDP variables in the model in logarithmic form allows the coefficients to be interpreted as elasticities, stabilizes the variance, and reduces the impact of the heteroskedasticity problem. However, the discount rate (IR) is not logarithmized, since it is already a relative indicator expressed in percentage form, and its logarithmic transformation can complicate economic interpretation. Keeping the IR variable in level form allows for a direct interpretation of the coefficient as a semi-elasticity.

The data used in the empirical analysis were obtained from the official statistical databases of the Central Bank of the Republic of Azerbaijan [28] and the State Statistical Committee [29]. The data were presented on a quarterly basis and processed appropriately for the analysis.

Methodology. To determine the short- and long-term interactions between the credit market and macroeconomic indicators in the Azerbaijani economy, the dynamic relationships among bank credit volume, real GDP, and the Central Bank's discount rate were analyzed using time-series econometric approaches.

In the initial phase of the empirical analysis, the stationarity properties of the variables were verified using the Augmented Dickey–Fuller (ADF) [6], Phillips–Perron (PP) [21], Dickey–Fuller GLS (DF-GLS) [9], KPSS [15], and Elliott–Rothenberg–Stock (ERS) [9] tests. Following the determination of the integration levels of the variables, the Autoregressive Distributed Lag (ARDL) [16; 19; 20; 22] bounds testing approach was applied to evaluate the existence of long-term equilibrium relationships among them.

Once the existence of a cointegration relationship was confirmed, an Error Correction Model (ECM) [10] was developed to estimate the short-term dynamics and the speed of adjustment toward long-term equilibrium.

In addition, the Toda–Yamamoto [23] causality approach was used to determine the direction of cause-and-effect relationships between variables.

Empirical results. In this study, an Autoregressive Distributed Lag (ARDL) model was constructed to evaluate the short- and long-term impacts of key macroeconomic factors—specifically real GDP and the Central Bank's discount rate—on the dynamics of bank credits. The findings serve to provide a clearer explanation of the transmission channels of monetary policy to the real sector and contribute to the formulation of economic policy decisions on a scientific basis.

In the initial stage of the research, the dynamics of the time series were evaluated through graphical analysis. Subsequently, descriptive statistics reflecting the primary statistical characteristics of the variables were calculated and analyzed. The dynamic representation of the variables is provided in Figure 4, while the descriptive statistical indicators are presented in Table 1.

An analysis of Figure 4 indicates that while the LN_LOANS variable exhibits an overall upward trend, this process has been accompanied by short-term fluctuations during certain periods. In contrast, the LN_GDP indicator is characterized by a relatively more stable and sustained growth dynamic, reflecting the long-term expansionary trend of economic activity. Meanwhile, the IR variable demonstrates significant shifts across periods, signifying that monetary policy has been implemented in varying directions throughout different stages of the timeline.

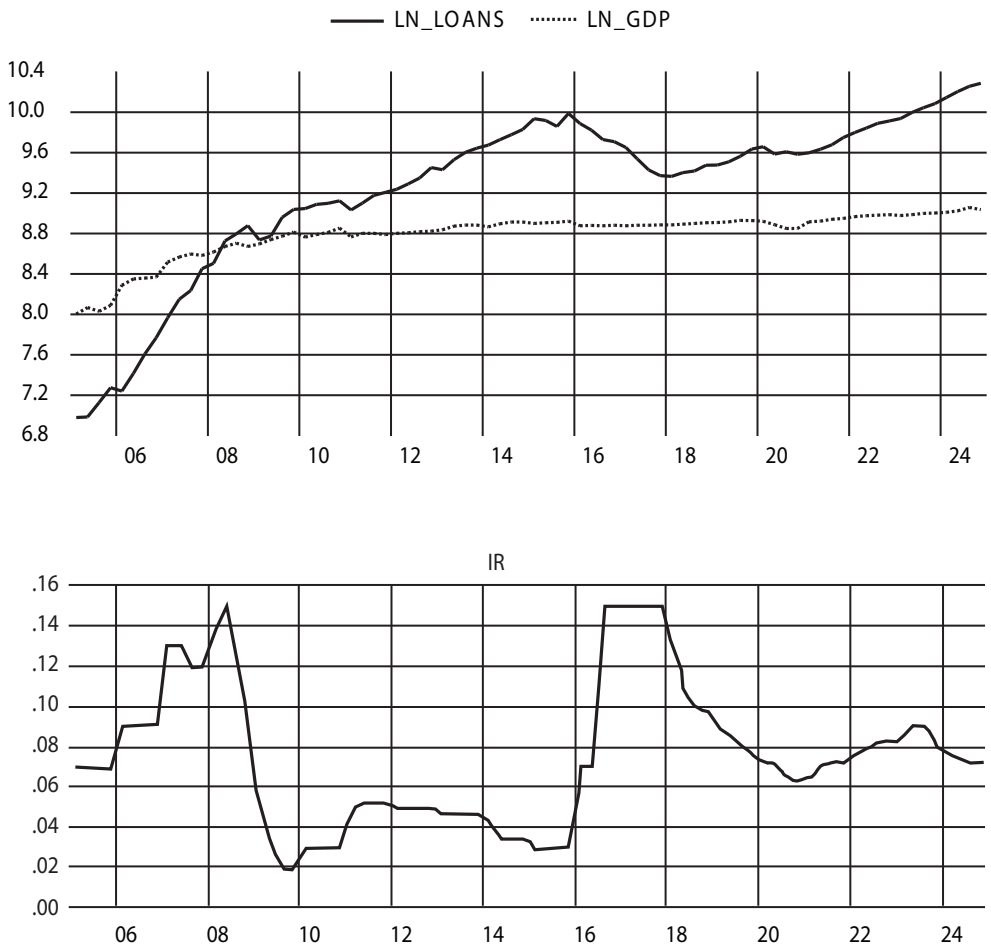

Fig. 4. Dynamic representation of time series

Source: developed by the author

Table 1

Descriptive statistics

	LN_LOANS	LN_GDP	IR
Mean	9.239589	8.775577	0.075719
Median	9.493156	8.776737	0.072500
Maximum	10.28494	9.218209	0.150000
Minimum	6.978680	7.766968	0.020000
Std. Dev.	0.808179	0.300405	0.035946
Skewness	-1.382622	-0.850841	0.625752
Kurtosis	4.193014	3.762524	2.642629
Jarque-Bera	30.23286	11.59055	5.646580
Probability	0.000000	0.003042	0.059410
Sum	739.1671	702.0462	6.057500
Sum Sq. Dev.	51.59911	7.129196	0.102077

Source: developed by the author

The analysis of descriptive statistics reveals that the normality assumption has been violated for certain variables. This phenomenon is typically attributed to the trends and structural breaks frequently encountered in macroeconomic time series. Nevertheless, in econometric modeling, the distribution of the residuals remains the primary point of significance.

In the subsequent stage, the stationarity properties of the variables employed in the model were verified through various unit root tests. The application of these tests facilitated a more robust determination of the degree of integration for each variable.

Based on the results of the graphical analysis presented in Figure 4, since a clear deterministic trend is observed for the LN_LOANS and LN_GDP variables, the results of the model with the trend component included for these variables were preferred. The results of the unit root tests conducted in Table 2 show that the unit root hypothesis is not rejected in most cases for the level values of both variables. At the same time, statistical significance is observed in all tests for the first differences and the unit root hypothesis is rejected. For this reason, the LN_LOANS and LN_GDP variables were evaluated as processes with an integration degree of I(1).

Graphical analysis of the IR variable showed that there was no deterministic trend in its level values. Therefore, in the interpretation of unit root tests, the results of the model with the fixed term were preferred. The rejection of the unit root hypothesis for most of the tests conducted indicates that the IR variable is stationary in its level value. Thus, the IR variable was accepted as an I(0) process.

Table 2

Results of unit root tests

Intercept				Trend and intercept	
Series	**Test**	**t-Statistic**	**Critical values***	**t-Statistic**	**Critical values***
LN_LOANS	ADF	-4.685010**	-2.898623	-3.403101	-3.468459
Δ *LN_LOANS*		-5.822491**	-2.899115	-6.491126**	-3.468459
LN_LOANS	DF-GLS	0.596520	-1.945024	-1.057509	-3.100400
Δ *LN_LOANS*		-5.547013**	-1.945024	-5.942352**	-3.100400
LN_LOANS	PP	-3.592570**	-2.898623	-2.714699	-3.467703
Δ *LN_LOANS*		-6.132530**	-2.899115	-6.803693**	-3.468459
LN_LOANS	KPSS	0.951120	0.463000	0.245485	0.146000
Δ *LN_LOANS*		0.455703**	0.463000	0.182829	0.146000
LN_LOANS	ERS	600.2100	3.054000	132.4553	5.672000
Δ *LN_LOANS*		0.819618**	3.051200	3.045372**	5.673600
LN_GDP	ADF	-2.926065**	-2.900670	-4.018679**	-3.470851
Δ *LN_GDP*		-3.661976**	-2.900670	-3.254181	-3.470851
LN_GDP	DF-GLS	0.445409	-1.945199	-1.296687	-3.110000
Δ *LN_GDP*		0.400751	-1.945199	-0.710182	-3.110000
LN_GDP	PP	-5.745822**	-2.898623	-7.436847**	-3.467703
Δ *LN_GDP*		-15.78756**	-2.899115	-16.38145**	-3.468459
LN_GDP	KPSS	1.022659	0.463000	0.341775	0.146000
Δ *LN_GDP*		0.219106**	0.463000	0.133518**	0.146000
LN_GDP	ERS	1023.090	3.054000	816.9998	5.672000
Δ *LN_GDP*		591.1587	3.051200	1732.020	5.673600
IR	ADF	-3.000170**	-2.899619	-2.983076	-3.469235
IR	DF-GLS	-3.001733**	-1.945081	-3.025062	-3.103600
IR	PP	-2.394754	-2.898623	-2.386435	-3.467703
Δ *IR*		-6.377309**	-2.899115	-6.692604**	-3.468459
IR	KPSS	0.112100**	0.463000	0.094963**	0.146000
IR	ERS	1.046848**	3.054000	3.810139	5.672000
*: The critical values are reported at the 5% level of significance.					
**: The null hypothesis of a unit root is rejected.					

Source: developed by the author

Taking these features into account, the Autoregressive Distributed Lag model approach was used to investigate the long-term relationship between variables. During the specification of the ARDL model, various options (trend, dummy, etc.) were tested, but the most stable and statistically significant results were obtained only in the model in which a constant was included. Since the addition of other components reduces the degree of freedom and worsens the diagnostic performance of the model, the simplest model was preferred.

The estimation results presented in Table 3 indicate that the ARDL model is statistically adequate. Specifically, the R^2 (0.9938) and Adjusted R^2 (0.9930) indicators demonstrate that a substantial portion of the variation in the dependent variable is explained by the model. Furthermore, the statistical significance of the F-statistic and its corresponding probability value confirms the adequacy of the model's overall specification.

The lagged value of the dependent variable (LN_LOANS(-1)) is positive and exhibits high statistical significance, indicating that the dynamics of the credit portfolio are substantially dependent on its past values. This, in turn, reflects the existence of a strong inertia effect within the credit market.

The fact that the majority of current and lagged coefficients for the LN_GDP variable are positive and statistically significant empirically confirms the expansionary effect of economic growth on lending. However, the observation of a

Table 3

Results of the ARDL model for LN_LOANS

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LN_LOANS(-1)	0.828156	0.045640	18.14525	0.0000
LN_GDP	1.006344	0.169707	5.929904	0.0000
LN_GDP(-1)	0.166966	0.061028	2.735874	0.0080
LN_GDP(-2)	0.179822	0.060241	2.985019	0.0040
LN_GDP(-3)	0.178406	0.060294	2.958925	0.0043
LN_GDP(-4)	-0.778521	0.151468	-5.139837	0.0000
IR	-0.437751	0.480950	-0.910180	0.3660
IR(-1)	1.085920	0.723218	1.501512	0.1380
IR(-2)	-1.087626	0.480697	-2.262602	0.0270
C	-4.990466	1.234212	-4.043442	0.0001
R-squared	0.993814	Mean dependent var		9.352684
Adjusted R-squared	0.992970	S.D. dependent var		0.654206
S.E. of regression	0.054851	Akaike info criterion		-2.846328
Sum squared resid	0.198567	Schwarz criterion		-2.539653
Log likelihood	118.1605	Hannan-Quinn criter.		-2.723766
F-statistic	1178.122	Durbin-Watson stat		1.585617
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection				

Source: developed by the author

negative and statistically significant coefficient at a further lag (LN_GDP(-4)) suggests the presence of regulatory effects within short-term dynamics.

Regarding the IR variable, the lack of statistical significance for the current period coefficient indicates that the impact of monetary policy on the credit market is realized through indirect mechanisms rather than direct ones. Nevertheless, the attainment of a negative and statistically significant coefficient for the lagged value IR(-2) demonstrates that the impact of the discount rate on lending is formed with a time lag, which is consistent with the characteristics of the monetary transmission mechanism.

In the next step, the ARDL bounds testing approach was applied to determine whether a long-term relationship exists among the variables in the model. Based on the results of this test, the existence of a cointegration relationship among the variables was established.

According to the results of the ARDL Bounds test given in Table 4, the $F_{overaall}$ (6.753) statistic exceeds the upper critical limits (I(1)) at all significance levels, which allows us to reject the null hypothesis that there is no level relationship between the variables. This result indicates that a long-term equilibrium relationship has been formed between the variables considered in the model. At the same time, the lower value of the $t_{dependent}$ (-4.569) statistic compared to the corresponding critical limits and the high level of the $F_{independent}$ (10.097) statistic further confirm the reliability and robustness of the results obtained.

Since the results of the ARDL bounds test indicate the existence of a long-term cointegration relationship among the variables, the long-run coefficients of the model were estimated in the next stage and are presented in Table 5.

The results of the presented long-run (cointegration) coefficients reflect the existence of economically significant and statistically substantiated relationships among the variables. The positive (4.3819) and highly statistically significant ($p < 0.01$) coefficient for the LN_GDP variable indicates that economic growth exerts a strong expansionary effect on the credit portfolio in the long run. Considering the logarithmic specification, this result implies that a 1% increase in GDP is accompanied by approximately a 4.38% increase in credits, which demonstrates the high elasticity of the credit market relative to economic activity.

On the other hand, the negative (-2.5573) and statistically significant ($p<0.05$) coefficient on the IR variable confirms that the increase in the discount rate has a restrictive effect on lending in the long run. This is explained by the decrease in credit supply and demand under the conditions of monetary policy tightening.

Based on the long-term coefficients, the following cointegration relationship is formed between the variables:

Table 4

Results of the ARDL bounds test

Bound tests		Null Hypothesis: No levels relationship		
Test Statistic	**Value**	**Significance %**	**I(0)**	**I(1)**
$F_{overall}$	6.753231	10	3.17	4.14
		5	3.79	4.85
		2.5	4.41	5.52
		1	5.15	6.36
$t_{dependent}$	-4.568766	10	-2.57	-3.21
		5	-2.86	-3.53
		2.5	-3.13	-3.8
		1	-3.43	-4.1
$F_{independent}$	10.097	10	2.36	4.36
		5	3.12	5.54
		2.5	3.87	6.65
		1	4.98	8.02

Source: developed by the author

Table 5

Results of the long-run (cointegration) coefficients for LN_LOANS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_GDP	4.381979	0.431344	10.15891	0.0000
IR	-2.557300	1.197698	-2.135180	0.0365

Source: developed by the author

$$ECT_{t-1} = ln_{LOANS_{t-1}} - 4.3820\ ln_{GAP_{t-1}} + 2.5573\ IR_{t-1}. \quad (3)$$

This equation generally expresses that in the long run, the loan portfolio has a positive relationship with GDP and a negative relationship with the discount rate.

At the next stage, the error correction model was estimated. The main element in the error correction model is the error correction coefficient (Error Correction Term). This coefficient shows how quickly deviations from the long-term equilibrium are eliminated in the short run. The negative and statistically significant coefficient indicates the existence of a long-term cointegration relationship between the variables and that the system returns to equilibrium over time. These results are shown in Table 6.

The ECM analysis calculated in Table 6 confirms the existence of short-term relationships between variables and the tendency of the system to long-term equilibrium. The negative (-0.1718) and statistically significant coefficient of CointEq(-1) indicates that approximately 17% of the deviations arising in the system are eliminated during each quarter. In the short-term period, D(LN_GDP) and its lagged values demonstrate that economic growth increases lending by having a positive and significant effect. It is observed that the effect on the IR variable is formed with a lag. Thus, the model adequately reflects both short-term effects and adaptation to long-term equilibrium.

The model reflecting short-term dynamics (analogous to the ECM model) is expressed as follows:

$$\begin{aligned}\Delta LN\_LOANS_t = {} & -4.9905 + 1.0063\Delta LN\_GDP_t + \\ & + 0.4203\Delta LN\_GDP_{t-1} + 0.6001\Delta LN\_GDP_{t-2} + \\ & + 0.7785\Delta LN\_GDP_{t-3} - 0.4378\Delta IR_t + \\ & + 1.0876\Delta IR_{t-1} - 0.1718 ECT_{t-1}.\end{aligned} \quad (4)$$

Here ΔLN_GDP_t and ΔLN_IR_t are the current values of the variables, ΔLN_GDP_{t-1} , ΔLN_IR_{t-1} are the short-term dynamics of the variables,

$ECT_{t-1} = ln_{LOANS_{t-1}} - 4.3820\ ln_{GDP_{t-1}} + 2.5573\ IR_{t-1}$ is the cointegration error (equilibrium bias), and $-0.1718\ ECT_{t-1}$ -is the adaptation rate.

Using formulas (3) and (4), ARDL is transformed into a structure corresponding to VECM by algebraic separations (groupings) of the levels of the variables. The difference here is that in the ARDL model, we assume that the effects are one-way, while in VECM, the interaction of factors at the same time point is taken into account.

A number of diagnostic and stability tests were applied to assess the adequacy and reliability of the model.

The results of the diagnostic tests conducted in Table 7 indicate that the model has reliable estimation properties. Thus, the result obtained for the Ramsey RESET test (p=0.6736) indicates that there is no functional form error in the model specification.

According to the results of the White (p=0.0568) and Breusch–Pagan–Godfrey (p=0.4538) tests, the heteroscedasticity problem is not observed.

Table 6

Results of the short-run dynamics of the Error Correction Model (ECM) for LN_LOANS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.990466	1.094890	-4.557963	0.0000
D(LN_GDP)	1.006344	0.122576	8.209979	0.0000
D(LN_GDP(-1))	0.420293	0.081789	5.138748	0.0000
D(LN_GDP(-2))	0.600115	0.078641	7.631059	0.0000
D(LN_GDP(-3))	0.778521	0.096414	8.074730	0.0000
D(IR)	-0.437751	0.446079	-0.981333	0.3300
D(IR(-1))	1.087626	0.468518	2.321418	0.0234
*CointEq(-1)**	-0.171844	0.037613	-4.568766	0.0000
* p-value incompatible with t-Bounds distribution.				

Source: developed by the author

Table 7

Results of diagnostic tests

Tests	Statistics	Prob.
Ramsey Reset	0.179050	0.6736
White	69.06034	0.0568
Breusch-Pagan-Godfrey	8.822277	0.4538
Breusch-Godfrey LM	5.410394	0.3679
Jarque-Bera	2.728585	0.255561
CUSUM	Stable	

Source: developed by the author

The presence of autocorrelation in the residuals was checked using the Breusch–Godfrey LM test, and the result obtained (p=0.3679) showed that this problem does not exist. At the same time, the Jarque–Bera test (p=0.2556) confirms that the residuals do not violate the assumption of normal distribution. In addition, the results of the CUSUM stability test indicate that the model parameters are stable over time. Overall, the results of the diagnostic tests confirm that the model is adequately specified and the obtained estimation results can be considered reliable.

In the final stage, the Toda–Yamamoto causality test was applied to assess the existence of cause-and-effect relationships between the variables.

The results of the Toda–Yamamoto causality test obtained in Table 8 show that a statistically significant relationship exists only from real GDP to bank loans. This indicates that the expansion of economic activity is one of the main determinants affecting the dynamics of the credit market. The lack of statistical significance of causal relationships in other directions indicates that the mechanisms of mutual or alternative influence between the variables have not been empirically confirmed.

Overall, the results reveal that the lending process is mainly formed under the influence of economic growth.

Conclusion. In the econometric analysis, the interaction of lending dynamics with macroeconomic factors and monetary policy instruments in the Azerbaijani economy was assessed based on the ARDL–ECM methodological framework, and the results obtained confirmed the existence of statistically significant long-term cointegration relationships between the variables. This result indicates that the credit market is structurally integrated with real economic processes and that financial intermediation acts as an integral component of economic activity.

Empirical assessments reveal that the main determinant of lending is real economic activity. The positive and statistically significant effect of GDP on loans confirms that credit expansion is formed as an endogenous result of economic growth. This result is consistent with the existing theoretical and empirical literature showing that financial intermediation is procyclical. At the same time, it shows that the negative effect of the Central Bank's discount rate on lending is transmitted to the real sector through the credit channel of monetary policy and that interest rate instruments play a significant regulatory role on the supply and demand of loans.

At the same time, the delayed realization of the impact of the discount rate reflects the time-dispersed nature of the monetary transmission mechanism and indicates that policy effects are transmitted to the economic system not immediately, but in stages.

The results obtained highlight several important implications in terms of economic policy. First of all, sustainable ex-

Table 8

Results of the Toda–Yamamoto causality test

Direction of Causality	Lag Length (k=2, dmax=1)	χ^2	P-value
LN_LOANS→LN_GDP	3	1.87	0.3920
LN_LOANS→IR	3	1.33	0.5127
LN_GDP→ LN_LOANS	3	11.16	0.0038*
LN_GDP→ IR	3	2.28	0.3186
IR→ LN_LOANS	3	1.13	0.5656
IR→ LN_GDP	3	0.03	0.9857
*: The critical values are reported at the 5% level of significance			

Source: developed by the author

pansion of lending cannot be ensured only by monetary instruments and must be complemented by institutional and structural development of the real sector. In this regard, improving the investment climate, expanding production and business activity in the non-oil sector act as the main conditions for the sustainable development of the credit market. On the other hand, taking into account the delayed nature of the impact of monetary policy on the credit market, the assessment of interest rate decisions should be carried out in the medium and long term, not in the short term. Limiting sharp and pro-cyclical changes in interest rate policy and forming a more predictable monetary framework can contribute to maintaining financial stability and reducing volatility in the credit market.

As a result, the study systematically reveals both the theoretical and empirical foundations of the interrelationships between lending, economic growth, and monetary policy instruments, contributing to a deeper understanding of the behavioral mechanisms of the credit market in the context of developing economies and providing scientifically sound directions for the formulation of economic policy.

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Додаткові матеріали: *Не передбачені.*
Внесок авторів (CRediT):
Бабазаде Г. Ш.: *концепція, методологія, формальний аналіз, дослідження, написання оригінального тексту, редагування та доопрацювання рукопису.*
Джерела фінансування: *Дослідження не отримувало зовнішнього фінансування.*
Вдячності: *Не передбачені.*
Конфлікт інтересів: *Автор заявляє про відсутність конфлікту інтересів.*
Використання ШІ: *Інструменти ШІ у підготовці цієї роботи не використовувались.*
Заява про оригінальність: *Наданий матеріал раніше не публікувався та в інші видання не надсилався.*

Supplementary Materials: *Not applicable.*
Author contributions (CRediT):
Babazade G. S.: *conceptualisation, methodology, formal analysis, investigation, writing – original draft, writing – review & editing.*
Funding: *This research received no external funding.*
Acknowledgments: *Not applicable.*
Conflict of interest: *The author declares no conflict of interest.*
AI use statement: *No AI tools were used in the preparation of this work.*
Originality statement: *The submitted material has not been previously published and has not been submitted to any other journal.*

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Стаття надійшла до редакції 18.05.2026 р.
Статтю прийнято до публікації 31.05.2026 р.
Оприлюднено 11.08.2026 р.