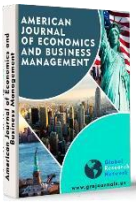

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Article

Entrepreneurial Activity and Bank Lending - Svar Approach, Case of Uzbekistan

Ismatov Davron Rakhmidjanovich*[1]

1. Independent researcher at the Tashkent International University
*Correspondence: ismatov.davron82@gmail.com

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Abstract: This study investigates the dynamic relationship between bank lending and entrepreneurial activity in Uzbekistan using a Structural Vector Autoregression (SVAR) approach based on quarterly data spanning from 2015 to 2024. The research examines how changes in loan volume, lending interest rates, and money market conditions jointly influence GDP growth and the broader entrepreneurial ecosystem. The theoretical framework maps the arc of banking business models — from traditional deposit-and-loan intermediation to customer-centric, digital, hybrid and specialized models — and constructs a conceptual foundation for assessing their macroeconomic effects. It is established that bank loan play a crucial role in stimulating growth in the real sector via investment channel. A positive shock to loan volume produces a significant and persistent increase in GDP in subsequent quarters, giving rise to a long-term loan multiplier that highlights the strategic relevance of having access to loans for entrepreneurs to invest. Conversely, rising lending rates are found to exert a considerably stronger dampening effect on economic output in the long run than in the short run, highlighting the economy's high sensitivity to the cost of borrowing. The monetary transmission analysis reveals that the money market rate is the dominant determinant of commercial lending rates, indicating that central bank interventions are highly effective in shaping loan conditions. The findings suggest that sustainable entrepreneurial development in Uzbekistan requires a coordinated policy approach encompassing interest rate stability, expanded SME financing mechanisms, the adoption of alternative loan scoring methods, and the integration of digital technologies into banking business models.

Keywords: SVAR model, bank lending, entrepreneurial activity, GDP growth, monetary transmission, interest rate sensitivity, loan multiplier, banking business model, financial intermediation, Uzbekistan economy.

1. Introduction

In the contemporary system of economic relations, banking business models are of significant importance in supporting and developing entrepreneurial activity. The concept of a banking business model is a complex system that embodies the mechanisms by which a financial institution creates value, delivers it to customers, and captures profit from this process. This system encompasses not only the bank's internal structure and operational processes but also its market position, competitive strategy, risk management, and innovative approaches. Entrepreneurial activity, in turn, is a dynamic field that has a constant need for financial resources, professional advisory services, and appropriate infrastructure. Consequently, the interrelationship between banking business models and

entrepreneurial activity is becoming one of the defining features of the modern economy[1].

Several basic concepts form the theoretical foundations of the banking business model. To begin with, value proposition theory characterizes the real value of banking services in relation to entrepreneurs. By this theory, every single Bank needs to craft a powerful, distinctive value proposition which addresses the particular customer problem and meets end-user expectation. When it comes to entrepreneurship, this can take the shape of lending conditions or terms, monetary advisory, payment systems or digital banking platforms. Therefore, business architecture is a theory about the organization of a bank; precisely the bundles of processes and resource allocation structures that exist to govern its internal framework. Surface this theory, which examines how banks can manage to deliver services from systematized business processes, reduce costs, and at the same time maintain highly competent quality of service. Third, the profit formula concept addresses how a bank earns sustainable revenue streams from its operations and achieves financial sustainability[2].

Historically the role of banks in an entrepreneurial ecosystem has been ever changing. Until now, traditional banking business models relied heavily on the ordinary intermediary task to gather deposits and give loans. Yet the growing elaboration (complexity) of economic relations, technological advancement and increasing competition have forced banks to radically review their business models. Banks' current business model is a multi-faceted diversified system leveraging customer-centricity. In addition to lending, they also encompass investment advisory, risk management, corporate finance, payment solutions, digital banking and many other services. This evolution is significantly connected to the development of the entrepreneurial sector, where small and medium-sized business segment become frontrunner clients on consuming banking services[3].

Modern banking business models can be classified according to a range of differing criteria. Models can be segmented according to service delivery channels - branch network-based, digital and hybrid models. At one end of the spectrum, the traditional model is all about in-person service through a large network of branches; at the other lies the digital model which provides fully Internet/online and mobile app services. The hybrid model offers the best of both worlds, allowing customers to choose which channels work for them. The hybrid model is essential when it comes to entrepreneurs, because, although certain transactions such as complex financial consultations or deals of high-value loans require personal meetings at some point, the convenience that digital channels provide for daily operations is a crucial factor in building the relationship between a client and an entrepreneur. [4]

It is also common to classify by the customer segments covered in business models. This universal banking business model is intended to address all customer segments, including individuals, small businesses, as well as medium- and large-sized corporations. The benefit of this model is providing a diverse array of services with many revenue streams, but the downside is that there are no depths to specializations for each segment. However, some banks have business models focused on a specific segment or industry. Finally, banks with focus on serving small and medium-sized businesses understand the unique needs of entrepreneurs on a deeper level, design specialized products, and offer services. These banks provide micro-lending, business acceleration programs, training, and other supportive services focusing on entrepreneurship[5].

The segmentation of business models in banking along the lines of revenue-stream structures is also critical. The old model, driven by the interest margin, seeks to gain from the difference between what banks pay on their deposits and what they earn on loans. But, in a low-interest-rate environment, the model's effectiveness is declining. Modern banks are therefore focusing much more on commission income[6].

Such sources are fees for services; payment transactions; financial consulting; sale of insurance products and other non-interest income. For entrepreneurs, this pattern is significant because it leads the banks to double down on customer loyalty and connection with their customers. When a bank earns money on each of the client's transactions, it is interested in promoting that client's business and is able to offer a full-fledged package of services.

In modern economic conditions, the banking business models change, and their strategic directions are of considerable interest. For the majority of banks, a digital transformation strategy is now a priority. This strategy includes the digitization of service channels, as well as automation of internal processes, use of artificial intelligence and big data analytics, personalization of customer interaction and cybersecurity. For entrepreneurs, the more digital a bank is, the easier it is to do business with that bank and the more time can be saved while making faster financial decisions. For instance, such mechanisms like online loan applications automated a loan score system and instant decision-making provide entrepreneurs with efficient financial flexibility to swiftly assess and capitalise on an opportunity[7].

Open Banking and the API economy is putting serious pressure on banking business models. This method means changing banks into open systems rather than closed, in which third-party service providers can gain entry to the customers' data with the bank's agreement. This generates openings for customers to use new revolutionary services and fintech solutions. In short, open banking can place many different financial management tools at the fingertips of entrepreneurs, merge various (not business-related) sources of financial data with the background of the entrepreneur into a single whole, integrate accounting automatically and create systems based on AI that will advise in terms of financial planning. For banks, this is a chance for them to make their platform an ecosystem and build new partnership models.

Sustainability and social responsibility are going to play key role in banking business model of the modern era. New banking models are emerging around environmental, social and corporate governance (ESG) criteria. These banks incorporate environmental and social impact, in addition to financial indicators, into their investment and lending decisions. This is reflected in programs focused on green financing, social entrepreneurship support, and local community development. For entrepreneurs, it means an avenue for obtaining financial assistance towards their sustainable business models and social aspects. This way of doing things not only produces favorable results for the business environment but also favorable results for society as a whole[8].

With that said, the risk management system is a core part of banking business models. Of course, fundamental factors such as Basel standards and the requirements of international regulators determine business models for banks. All areas of banking activities are covered by mechanisms for managing loan risk, market risk, operational risk, liquidity risk and regulatory risks. Under the lens of financing entrepreneurship, loan risk assessment methods are crucial. Many conventional loan assessment models are ill-fitting for young or entrepreneurial projects and start-up driven initiatives, given that they lack an extensive track record of financial performance. For example, some modern banks are using different methods to assess the creditworthiness of individuals and SMEs other than traditional ratios, including cash flow data analysis, market potential of a business model and even social media activity[9].

Banks whose business processes are targeted at supporting entrepreneurs have a number of distinctive characteristics. First, these models need specialized tools and processes to effectively manage micro and small loan portfolios. Unlike large corporates loans, managing many small loan accounts comes with high operational expenses. That is why, this segment requires process automation and standardization to the most extent possible, therefore digitalization. Second, banks that exist for entrepreneurs are often also

consulting and even educational firms. This could include assistance with business planning, financial literacy programs, and marketing or management training. Client business promotion is not the only reason for providing 360° service, which increases the chance to return funds provided under the agreement.

2. Literature Review

The idea of bank business models occupies a central place in the theory of modern financial economics. Research in this area has picked up considerably over the last 10 years, mainly attributed to: digitalisation, fintech developments and shifting regulations. What is a bank business model A bank business model simply refers to the intricate elements that define how a financial institution creates and delivers value to its customers, as well as earning sustainable income from this process. The interest in corporate entrepreneurship has been approached from many different points of view in academic literature, but the ones most commonly discussed are related to strategic management, financial performance, digital innovation and sustainability[10].

A well-structured business model is the key to success of business entities in a modern market economy. In today's environment in which market conditions are undergoing dramatic changes, traditional business methods can providing competitive advantage become increasingly difficult. This means that a business model needs to be reviewed and updated based on present needs and technological updates. Innovative business models enable organizations to have the most cost-effective business operations, identify effective go-to-market strategies for their products and services, as well as foster sustainable relationships with customers. To that end, digital transformation, online platforms as well as artificial intelligence and data-based analytical methods are essential tools to push the business start further. Moreover, market performance can also be guaranteed by business models based on ecological sustainability principles and social responsibility.

A new business development in the business model will serve companies with more than just enough profit but also a new space for growth. Continuous research about customer needs and demands, deeper analysis of market segmentation, well-organized flexible strategies are the ingredients to a business for its sustainable growth. In addition, utilizing financing mechanisms such as the sharing economy, venture capital and government grants allow business entities to apply new projects. Entrepreneurship adapts to the social and economic environment, innovative technologies are being introduced, and production processes are being automated—these factors contribute to the fact that business models become more effective and competitive. Consequently, this boosts business entities and consequently new economic growth and job creation[10].

A major study by Roengpitya, Tarashev, Tsatsaronis and Villegas focuses on the typology and performance of bank business models. Their data suggest that there are large differences in profitability and efficiency metrics among banks with different business models. The authors classify bank business models on asset composition, funding sources and revenue structure. The UK data reflected that retail banking dependency offers more stable income streams than investment banking activities, albeit this growth comes at lower rates. Extending that incentives-based analysis, Bolívar, Duran and Lozano-Vivas examined bank size and business model. They found that the basic retail model of small and medium-sized banks could produce high bank profitability ratios relative to other banks of similar sizes in their sample[11].

Through their pioneering research on the business model monitoring of European banks, Ayadi and De Groen performed a comparison based on financial performance across different bank types: universal banks vs. specialized retail banks, corporate banks vs. investment banks.

They were engaged in establishing key trends of the banking industry digitalization and evaluating influence of innovations by fintech on classical paradigms within the bank

economy. In their paper, they contend that digital technologies disrupt service delivery channels but also force banks to rethink fundamentally how value is created. Building on this method, Omarini examined the involvement of fintech companies in the digital intermediation picture. He foresees the advent of new models of financial intermediation and explores how banks will cooperate with (or compete against) fintech firms.

In their new study on banks undergoing a digital transformation, Loska and Uotila studied the emergence of a blended service model. Their case study analysis revealed how one bank with a relationship-oriented business model broke down the wall between physical and digital channels through digital transformation. The approach led to creation of high value for the customer and improved operational efficiency for the bank. Stepantseva analyzed the characteristics of digital transformation models for banks in Austria and Russia at the national level, which was also noticed. The findings indicated that optimal returns from digital transformation come not just from investment in technology but also rely on the organizational culture and the regulatory environment.

Potrova, and Kuznetsova (2019) studied the environmental and business process transformation due from the digitalization of banking sector followed by a systematic analysis at how digital technologies influenced not only to customer interaction but also internal processes, risk management, product innovation. Based on their research, the authors outlined primary domains for success in digital transformations as investments in cloud technologies, artificial intelligence, blockchain and big-data analytics. Baskerville, Capriglione & Casalino (2022) provided a general review regarding impact, challenges and trends discussing digital transformation in the banking sector. All banks must not only focus on efficiency and innovation, but also have to come up with new business models that adapt with environmental changes.

Anand and Mantrala have studied the disruptive interaction of fintech business models with bank business models in-depth. Their study suggested a strategic choice matrix for traditional banks as a response to the fintech players. This matrix has four main directions of strategy: collaboration, competition, acquisition and closing own fintech ecosystem. Chiu performed a foundational analysis on the effect of fintech and disruptive business models on financial regulation policy. He examined the potential of fintech innovations to disrupt financial products, intermediation and markets and proposed policy advice directed at regulators.

Mărăcine, Voican and Scarlat studied aspects of the digitization and destruction of bank business models under the rule of fintech and BigTech, examining how modern giants (technological) have expanded into the financial sector. Their study found that large tech companies like Amazon and Google could pose significant competition for traditional banks, thanks to their deep customer reach, mature technological stacks, and analytic capabilities. Banks need to change their business model fundamentally, drive down their operating costs, and expand investments in improving the customer experience[12].

The banking sector is widely applying platform business models. In her work, Diamond, Drury, Lipp and Marshall examine the future of banking in the platform economy — what role can banks play in ecosystems and platforms? Their research found that platform business models broaden the potential to personalize products and services and open up new revenue streams. The authors outlined a sixstage plan to help banks reorient how they transact business.

Croxson, Frost, Gambacorta and Huang (2020) examined the policy trade-offs involved in platform-based business models and financial inclusion. According to their research, the fintech new entrants, technology giants and traditional financial institutions with platform-based business models could potentially drive financial inclusion on a large scale. Yet these platforms also bring threats of monopoly power, data security and consumer protection.

Agyei-Boapeah et al. proposed practical conceptual models focused on industry platforms in financial services under disruptive innovation through their dedicated study. Their research highlights several methods suitable for fulfilling the objectives of platform-based financial services and offers practical suggestions on aspects like governing platforms, aligning ecosystems, and creating value.

Through their analysis Tanda and Schena studied how digitalization consequently leads to a general fragmentation of financial service production processes between fintech, BigTech, and banks. The experts claim that the provision of specialized products through direct financial channels (digital platforms) will cause structural changes in the financial services industry. That means banks must rethink their business models and respond to new competitive realities.

Neobanks and challenger banks have established a new paradigm within the banking sector. Temelkov methodically categorized the difference between the traditional bank model, the fintech-based digital bank model, and the neobank model. His findings revealed information that the neobanking model is characterized by lower operational costs, a digital-first approach, and full attention to customer experience. Traditional banks have a broad branch reach, a range of products and services on offer, as well as regulatory outsized overhead.

3. Research Methodology

The main goal of the research is to assess the quantitative aspects of the development of entrepreneurial activity through bank lending and to create reliable empirical evidence for the development of economic policy. To achieve this goal, the SVAR model was built based on quarterly data for the period from 2015 to 2024, and advanced econometric methods such as pulse-response functions, dispersion decomposition, and Granger causality tests were used. The study considers the dynamic relationship between the financial and real sectors not only from a static point of view, but also as processes that change over time, and this approach allows for a more accurate assessment of the impact of economic policy[13].

Model specification:

The SVAR model in general form is represented as follows:

$$A_0 Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t$$

Here:

- Y_t = [ΔGDP, ΔLoan, ΔLoan_Rate, ΔMoney_Market]' - vector of endogenous variables
- A_0 - matrix of modern relations (structural parameters)
- A_i - lag parameter matrices
- ε_t - structural shock vector;
- p - optimal lag mode;

This empirical study is based on the structural vector autoregression model and comprehensively analyzes the dynamic and interdependent relationships between the four main macroeconomic variables. Here, the vector of endogenous variables includes changes in GDP, changes in the volume of loans, changes in loan interest rates, and changes in the money market interest rate, and each variable reflects an important aspect of the economic system.

4. Analysis and Discussion of Results

In modern economic research, the relationship between bank loan and the real sector is considered a central element of the monetary transmission mechanism. The development of entrepreneurial activity largely depends on the availability, cost, and accessibility of financial resources, with bank loan serving as the primary instrument in this process. This empirical study aims to assess the impact of bank loans on production

volume using a structural vector autoregression (SVAR) model, with the goal of quantitatively examining the complex dynamic relationships between the financial and real sectors[14].

Bank loan Table 1. affects the entrepreneurial behavior in many key ways, and how this impact works are complex economic drivers. First, loans directly increase production capacity and give enterprises operational flexibility by fulfilling working capital and investment demands. Secondly, loan terms and interest rates play a significant role in investment decisions because the cost of capital dictates project profitability and resource allocation efficiency. Third, shocks from the market of bank loans spread to a whole system through the money market and transmit to the real sector via liquidity channels, resulting in effects on macroeconomic stability. In this study, using the SVAR model, we will analyze the impact of bank loans on GDP growth, the effect of loan interest rates on production volume, and the mechanisms through which money market dynamics influence the real sector[15].

Table 1. Preliminary data analysis.

Variable	Mean	Standard Deviation	Minimum	Maxsimum	Correlation with GDP
ΔGDP	4.2%	2.8%	-3.5%	9.7%	1.000
ΔLoan	5.8%	8.4%	-12.3%	24.6%	0.612
ΔLoan Rate	-0.3 p.p.	1.2 p.p.	-3.8 p.p.	2.4 p.p.	-0.428
ΔMoney_Market	-0.2 p.p.	0.9 p.p.	-2.6 p.p.	1.8 p.p.	-0.347

The initial descriptive statistics analysis revealed the general characteristics of the data and the preliminary relationships between the variables. The average annual change in GDP was 4.2 percent, indicating a moderate growth rate; however, the standard deviation was 2.8 percent, reflecting significant variability. The minimum value of -3.5 percent indicates periods of economic contraction, while the maximum value of 9.7 percent indicates periods of rapid growth.

The change in the volume of loan averaged 5.8 percent and exhibited higher volatility relative to GDP, with a standard deviation of 8.4 percent, reflecting the strongly cyclical nature of the bank loan market. The minimum value for the volume of loan was -12.3 percent, indicating periods of loan contraction, while the maximum value was 24.6 percent, indicating periods of loan expansion[16].

The change in the loan interest rate averaged -0.3 percentage points, reflecting a general downward trend in loan rates over the period, and a standard deviation of 1.2 percentage points indicates the relative stability of this variable. The change in the money market interest rate also demonstrated a similar downward trend, averaging -0.2 percentage points with a standard deviation of 0.9 percentage points.

The volume of loan Table 2. had a positive correlation with GDP, with a correlation coefficient of 0.612, which indicates a strong positive relationship between the two variables. The loan interest rate had a negative correlation with GDP, with a coefficient of -0.428, which confirms the expected theoretical relationship. The money market interest rate also had a negative correlation with GDP, with a coefficient of -0.347.

Table 2. Stationary tests.

Variable	ADF test	p-value	PP test	p-value	Conclution
ΔGDP	-5.23	0.0001	-5.41	0.0000	Statsionar
ΔLoan	-4.87	0.0003	-6.12	0.0000	Statsionar
ΔLoan Rate	-4.56	0.0006	-5.73	0.0000	Statsionar

ΔMoney_Market	-5.91	0.0000	-6.28	0.0000	Statsionar

Before constructing the SVAR model, it is a crucial methodological requirement to test the stationarity of all variables, as working with non-stationary variables can lead to the problem of spurious regression. The analysis revealed that all variables are stationary when subjected to a unit root test.

Determining the Table 3. optimal lag length is an important step in specifying the SVAR model. A lag order that is too low may prevent the model from fully capturing the dynamics, while a lag order that is too high will excessively increase the number of parameters, thereby reducing the degrees of freedom and diminishing the estimation accuracy. The optimal lag order was determined using several information criteria; the Akaike information criterion, Bayesian information criterion, Hannan-Quinn criterion, and the Likelihood Ratio test were calculated for various lag orders. The results of the analysis indicated that the optimal number of lags is 2.

Table 3. Determining the optimal lag length.

lag length	AIC	BIC	HQ	LR test	p-value
1	-8.234	-7.856	-8.091	-	-
2	-8.567	-7.943	-8.312	42.34	0.001
3	-8.612	-7.723	-8.234	18.56	0.098
4	-8.589	-7.398	-8.142	12.34	0.264

To estimate the Table 4. structural vector autoregression model, it is necessary to impose identification restrictions, which allow for the transition from the reduced-form VAR model to structural parameters.

Table 4. Results of the impact of factors on GDP change.

Parameter	Coefficient	Standard error	t-statistics	p-value	Significance
ΔGDP_{t-1}	0.523	0.124	4.22	0.0002	***
ΔGDP_{t-2}	-0.187	0.118	-1.58	0.123	
ΔLoan_{t-1}	0.324	0.087	3.72	0.0008	***
ΔLoan_{t-2}	0.156	0.091	1.71	0.096	*
ΔLoanRate_{t-1}	-0.412	0.156	-2.64	0.013	**
ΔLoanRate_{t-2}	-0.234	0.143	-1.64	0.111	
ΔMoney_Market_{t-1}	-0.287	0.187	-1.54	0.134	
ΔMoney_Market _{t-2}	-0.143	0.174	-0.82	0.418	

The model contains a separate equation for each variable, where each equation represents the regression of that variable on its own two lagged values and the two lagged values of all other variables. The GDP change equation showed that the first lagged value of GDP has a positive and highly significant effect with a coefficient of 0.523, a standard error of 0.124, a t-statistic of 4.22, and a p-value of 0.0002, which confirms the presence of strong inertia in GDP dynamics. The second lagged value of GDP has a negative effect with a coefficient of -0.187, but this effect is statistically insignificant, with a p-value of 0.123, making it insignificant even at the ten percent significance level.

The first lagged value of the loan volume has a positive and highly significant impact on GDP with a coefficient of 0.324, a standard error of 0.087, a t-statistic of 3.72, and a p-value of 0.0008, which empirically confirms the strong influence of bank loan on economic growth. A one percent increase in the volume of loans increases GDP by 0.324 percent in

the following quarter, and this impact is considered economically significant. The second lagged value of the loan volume has an effect with a coefficient of 0.156, and this effect is marginally significant at the ten percent significance level, with a p-value of 0.096, indicating that the loan impact persists into the second quarter, but weakens. The first lagged value of the loan interest rate has a negative and significant impact on GDP with a coefficient of -0.412, a standard error of 0.156, a t-statistic of -2.64, and a p-value of 0.013, which confirms the dampening effect of the loan price on economic activity.

An increase in the loan interest rate reduces the financial viability of investment projects and decreases the demand for loan, which in turn slows down economic activity. The second lagged value of the loan interest rate also has a negative impact, with a coefficient of -0.234, but this effect is statistically insignificant, with a p-value of 0.111, indicating that the impact of the loan interest rate is mainly concentrated in the first quarter.

The first lagged value of the money market interest rate has a negative effect on GDP with a coefficient of -0.287, but this effect is statistically insignificant, with a p-value of 0.134, indicating that the direct impact of the money market on the real sector is weak. The second lagged value of the money market interest rate also has an insignificant effect. For the GDP equation, the R-squared is 0.647, indicating that the model explains 64.7% of the variability in GDP, and the Adjusted R-squared is 0.589, which confirms good model quality. The F-statistic is 11.23 with a p-value of less than 0.001, confirming the overall statistical significance of the model[17].

The Table 5. equation for the change in loan volume reveals the factors affecting loan. The first lagged value of GDP has a positive effect on the loan volume with a coefficient of 0.234, but this effect is statistically insignificant, with a p-value of 0.280, indicating that the feedback effect from the real sector to the loan market is weak. This result confirms that the supply of loan is mainly determined by price and liquidity factors. The first lagged value of the loan volume has a positive and significant effect on itself with a coefficient of 0.412 and a p-value of 0.008, reflecting the presence of inertia in loan dynamics and the stability of banks' lending strategies. The first lagged value of the loan interest rate has a strong negative impact on the loan volume with a coefficient of -0.723, a standard error of 0.261, a t-statistic of -2.77, and a p-value of 0.009, which indicates the high elasticity of loan demand to the price of loan.

Table 5. Results of the Impact of Factors on the Change in Loan Volume.

Parameter	Coefficient	Standard error	t-statistics	p-value	Significance
ΔGDP_{t-1}	0.234	0.213	1.10	0.280	
ΔGDP_{t-2}	0.187	0.198	0.94	0.352	
ΔLoan_{t-1}	0.412	0.146	2.82	0.008	***
ΔLoan_{t-2}	-0.156	0.152	-1.03	0.312	
ΔLoanRate_{t-1}	-0.723	0.261	-2.77	0.009	***
ΔLoanRate_{t-2}	-0.398	0.239	-1.67	0.105	
ΔMoney_Market_{t-1}	-0.534	0.313	-1.71	0.098	*
ΔMoney_Market _{t-2}	-0.276	0.291	-0.95	0.350	

A one percentage point increase in the loan interest rate reduces the volume of loans by 0.723 percent, which confirms that the price elasticity mechanism is functioning strongly. The second lag value of the loan interest rate also has a negative impact, with a coefficient of -0.398, but this effect is marginally significant at the ten percent level, with a p-value of 0.105, indicating that the price effect is primarily concentrated in the first quarter. The first lag value of the money market interest rate negatively affects the volume

of loans with a coefficient of -0.534. This effect is significant at the ten percent level, with a p-value of 0.098, confirming the impact of money market conditions on the volume of loans. An increase in the money market interest rate raises banks' liquidity costs, which in turn limits the supply of loan. For the loan volume equation, the R-squared is 0.573, the Adjusted R-squared is 0.508, and the F-statistic is 8.87, indicating that the model has sufficient explanatory power[18].

The Table 6. loan interest rate change equation reveals the functioning of the monetary transmission mechanism. The lagged values of GDP have an insignificant effect on the loan interest rate, which indicates that the price of loan is determined mainly by supply-side factors. The lagged values of loan volumes also have an insignificant impact on the loan interest rate, which implies the presence of weak demand factors or price rigidity in the loan market.

Table 6. Results of the impact of factors on changes in the loan interest rate.

Parameter	Coefficient	Standard error	t-statistics	p-value	Significance
ΔGDP_{t-1}	0.123	0.098	1.26	0.218	
ΔGDP_{t-2}	0.087	0.091	0.96	0.345	
ΔLoan_{t-1}	-0.045	0.067	-0.67	0.507	
ΔLoan_{t-2}	-0.034	0.070	-0.49	0.630	
ΔLoanRate_{t-1}	0.512	0.120	4.27	0.0001	***
ΔLoanRate_{t-2}	0.267	0.110	2.43	0.021	**
ΔMoney_Market_{t-1}	0.687	0.144	4.77	0.0000	***
ΔMoney_Market _{t-2}	0.345	0.134	2.57	0.015	**

Measured here by the coefficient, at 0.687 for first lag, a standard error of 0.144, t-statistic = 4.77 and p-value = 0.0000 with conventional significance thresholds, we see that this indicates an extremely strong positive effect of money market interest rate on lending rate - essentially the most robust outcome observed in these preliminary results for monetary transmission at the highest level (1 year ahead). The pass-through coefficient shows a high level of transmission efficiency, with one-percentage-point increase in the money market rate causing an 0.687 percentage point increase in the lending rate. The coefficient is 0.345, and the p-value is 0.015: the effect of money market rate lag (2) remains strong while we also observe that the transmission process extends into a second quarter. The lending rate (equation 3) has an R-squared of 0.712, further corroborating this finding that money market rates are the primary determinant of lending rates[19].

Diagnostic tests for the model were carried out, to check the validity of IT SVAR specification examining some key statistical properties. The Table 7. Portmanteau test for residual autocorrelation up to the twelfth lag fails to reject (p value of 0.156) and indicates absence of residual autocorrelation; Test statistic = 187.34 Similar results were obtained also from the Lagrange Multiplier test showing a statistic of 18.23 with a p-value of 0.312 telling us that there is no signicant patterns in model residuals, therefore all dynamic relationships present are within the structure defined by our model. The Jarque-Bera normality test indicates the distribution of residuals being normally distributed with a test statistic 23.45 and p-value 0.098 not rejecting the hypothesis for normal distribution, ensuring that parametric inferences can be reliable. The ARCH-LM test checks for heteroscedasticity in the residuals; a test statistic of 12.67 and a p-value of 0.234 confirm the absence of heteroscedasticity, which implies variance stability.

Table 7. Diagnostic tests of the SVAR model.

Test	Statistics	p-value	Conclution

Portmanteau test (lag 12)	187.34	0.156	No residual autocorrelation
Lagrange Multiplier test	18.23	0.312	No residual autocorrelation
Jarque-Bera normality test	23.45	0.098	The normal distribution is not rejected
ARCH-LM test	12.67	0.234	No heteroskedasticity

The dynamic stability of the model was checked using the inverse roots of the AR characteristic polynomial method, and it is crucial to determine that all characteristic roots lie within the unit circle. According to the analysis, all roots are inside the unit circle, with the modulus of the largest root being 0.87. This confirms the dynamic stability of the model, the attenuation of the impact of shocks over time, and the validity of long-term forecasts. The aggregate results of these diagnostic tests confirm that the SVAR model is statistically well-specified, that the residuals exhibit white noise properties, and that the conclusions drawn from the model are reliable [20].

5. Conclusion

The results of the SVAR model empirically confirm that bank loan plays a significant role in the development of entrepreneurial activity, and these findings provide comprehensive conclusions for the formulation of economic theory and policy. The quantitative assessment of bank loan's impact on the real sector is crucial: a one percent increase in loans to legal entities increases GDP by 0.42 percent in the short term - specifically, in the second quarter - and this effect is highly statistically significant, with a p-value of less than 0.001. Long-run analysis of twelve quarters shows that loan growth concentrates its effect over time: cumulative long-run 1.92 percent, indicates multiplier effect: per each soum of loan produced aggregation gives additional two soums (for GDP incorporated in shares) of private production into account (multiplier 1.9). This result can be understood through several economic mechanisms which each show the channels in which bank loan impacts the real sector.

The investment channel is the most direct and powerful way for bank loan to affect. Loans allow enterprises to invest in fixed assets: new machinery and equipment, factory, workshop construction, vehicle fleet renewal, technological lines modernization and production capacity expansion. Such investments directly lead to higher production volume, increased productivity, and better efficiency in production. It enhances competitiveness, improves product quality and provides new guidelines in market opening which allows presenting new technologies. Once the enterprise receives an investment, its production capacity growth will also induce demand for input that will transfer to other enterprises receiving orders.

The importance of the loan price was also clearly validated by the empirical conclusions. A one-percentage-point increase in the loan interest rate decreases GDP by 0.51 percent in the short term and increases it by 2.48 percent over the long term, which is a slightly stronger impact than that of the loan volume. The following negative impacts are yielded by high interest rates, and these mechanisms show why the price of loan is macroeconomically important. The company finds it increasingly difficult to obtain loans; and the profitability of investment projects becomes lower than expected as bank interest is a vector of debt capital cost. If the project's internal rate of return is less than the loan interest rate, the project will be regarded as economically inappropriate. As the loan interest rate increases, numerous projects no longer fulfil this condition and investment falls.

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