

Drivers of Credit Supply in Iran's Agriculture: Symmetric or Asymmetric Relationship?

Farzin Feizizad¹ , Shahriar Nessabian² , Reza Moghaddasi³ 

¹ Islamic Azad University, Tehran Branch, Tehran, Iran

² Faculty of Economics and Accounting, Islamic Azad University, Tehran Branch, Tehran, Iran

³ Faculty of Agricultural Sciences and Food Industry, Islamic Azad University, Science and Research Unit, Tehran, Iran

Abstract

Agriculture, one of the most important sectors of the Iranian economy that plays a vital role in providing food security and job opportunities, has always been faced with a lack of financial and credit resources. Therefore, identifying the drivers of credit supply to this sector is of great importance. The main objective of this study was to determine the factors affecting Agriculture Bank (Bank Keshavarzi of Iran) credit supply as the main source for financing agricultural activities, in Iran. In this regard, provincial panel data for period 2007-2020 and non-linear autoregressive distributed lag model, which distinguishes this research from those of previous years, have been used. The results indicate the asymmetric effect of all independent variables on credit supply of Agricultural Bank or the superiority of non-linear model in explaining the relationship between variables. For example, the positive shock on the value of bank assets with coefficient of 0.18 and its negative shock with coefficient of -0.05 will affect the growth of credit supply in the long run.

Based on research findings and in order to increase credit supply, it is recommended that Agricultural Bank put the control of non-current receivable more effectively (especially through careful evaluation of borrowers' eligibility) in its policy priorities and, therefore, reduce credit risk and perform more effective services in financing of agricultural sector. In addition, an increase in the bank's assets through investment in modern information and communication technologies is strongly recommended.

Keywords

Non-current receivable, NARDL, Agricultural Bank, Iran.

Feizizad, F., Nessabian, S. and Moghaddasi, R. (2025) "Drivers of Credit Supply in Iran's Agriculture: Symmetric or Asymmetric Relationship?", *AGRIC on-line Papers in Economics and Informatics*, Vol. 17, No. 1, pp. 21-30. ISSN 1804-1930. DOI 10.7160/aol.2025.170102.

Introduction

Banks are considered as the most important sources for financing enterprises, production, and investment projects in developing and developed countries (Banga, 2013). In fact, banks are linked to the real economic sector through the monetary policies implemented by the central bank. These policies are discussed from both supply and demand perspectives. The monetary view (demand side) that is analyzed through the interest rate channel and exchange rate, and the credit view (supply side) can be assessed through the provided facilities and the banks' balance sheet (Mishkin, 2013).

In this regard, present research focuses on supply side. All economic strata of a country, especially

households, businesses, and manufacturing as well as government are involved with banks and banking facilities because it is a requirement of a dynamic economy. Banks are therefore the main source of financing for firms in many countries of the world. Access to banking facilities and credits for many firms provides the opportunity to invest in projects and the economic development. Banks are therefore highly effective in the economic development of countries and improve the economic growth of countries.

From an economic point of view, access to credit and other banking services is very important for economic agents (households, businesses and government). Bank credits are a useful tool for promoting economic growth, especially in the early stages of development. This stems

from the basic importance of credit in providing the necessary funding for investment projects in developing countries since bank deposits are the most important part of the national money supply. Thus, a large portion of the capital needed by the production units is provided by the banking system.

Thus, the performance of banking system is vital in production, economic prosperity and prices of goods. Uncertainty in access to bank credits and its associated cost provides a good ground for economic disarray. Therefore, identifying factors influencing credit supply can contribute significantly not only to the growth and development of banks but also to the development of the country. Thus, present study focuses on exploration of credit supply drivers of Iran's Agricultural Bank (IAB) using provincial panel data.

In Iran, various institutions and institutions, both official and informal, are responsible for financing the agricultural sector, including commercial banks, agricultural banks, rural co-operative organizations, agricultural sector support funds, nomadic co-operatives, Al-Hasana loan funds, unions and production cooperatives, and other producers' organizations from official and unofficial sources of financing of the agricultural sector. However, the most important institution among the above mentioned issues has been the Agricultural Bank.

Bank credits for agricultural sector are provided at both macro and micro levels. Since most of the poor are in rural areas, and most of them are involved in agriculture and related activities, the amount allocated to this sector is usually at micro level, and this solution (micro credit to agriculture sector) has always been regarded as an appropriate way to reduce poverty. In rural and agricultural development, one of the most important ways to solve the financial problems of farmers is to give facilities at the micro level, which plays a significant role in focusing and directing the low-level rural capital and creating a spirit of participation and also expanding public activities (Hacievliyagil and Eksi, 2019).

On the other hand, farmers seek bank credits to supply machinery such as tractors, raw materials such as fertilizers and farmland, and to provide the necessary facilities to improve the agricultural sector performance, as well as purchasing and paying the equipment costs to raw materials. Bank credits are therefore of considerable importance in the agricultural sector, and in many developing countries credit financing is the most important financial tool in large-scale private

savings (Awad and Al Karaki, 2019).

In general, the goals and areas for which micro-credits are allocated in the agricultural sector are: 1- credit for meeting individual needs such as preparing pesticides for agricultural pests, purchasing chemical fertilizers, purchasing agricultural inputs, repairs to agricultural equipment such as tractors and water pumps. 2- Short-term assistance to farmers to solve liquidity problems, due to the seasonal nature of the crop and farmers' income. 3- Helping the farmers to meet their need and avoid going to the informal financial sector and ease of obtaining loans and credits from official credit sources due to lack of collateral (Bakhtiari and Shayesteh, 2006).

Factors affecting the supply of facilities in both supply and demand dimensions are studied. The present study focuses on the supply dimension. In this context, factors affecting the granting of facilities in the supply side focus on factors affecting the volume of facilities granted by banks. These factors are common in the three main categories of domestic factors of banks and balance sheets, macroeconomic factors and monetary policy factors (Rabab'ah, 2015).

There are many factors in the balance sheet and internal factors of banks. Bank size is one of the most important variables in domestic factors and bank balance sheet (Almazari, 2014). In this study, it is considered as an external variable to investigate factors affecting agricultural bank facilities in Iranian provinces. Bank size is defined as the ratio of bank assets (in this study by the Agricultural Bank) to total assets of the banking system in each province (Chernykh and Theodossiou, 2011). In addition, one of the most important problems of Iranian banking system is that bank facilities are highly efficient. Rising volume of current receivables (deferred receivables) has led to a serious challenge for bank liquidity management. On the other hand, accumulation of bank failures may pressure the central bank to supply liquidity with monetary base. Many factors increase non-current demand in the banking system, such as the continued devaluation of the national currency and the sovereign structures in companies and banks, severe fluctuations in forecasting markets, high dissimilarity of interest rates with common market rates, rising false jobs and employment of unqualified people in the export and import manufacturing industry have often used various banking facilities. One of the most important consequences of monetary activities of banks and credit institutions is loose

monetary demand which has a significant impact on the economic performance of society. Non-current demands have many ramifications on the economy of a society, which can lead to even a recession if it is not properly monitored. Thus, non-current demands can, besides reducing banks' profitability, slow the flow of liquidity in an economy, lack of allocation of credit at the appropriate time and in a timely manner to apply productive investments in various fields of agriculture, trade and industry. non-current receivable are one of the most important factors influencing the granting of facilities in any banking system, which, if not taken seriously, can even have inadequate consequences on a society's economy such as the disruption of bank intermediation, increased credit risk and reduced economic growth (Imran and Nishat, 2013; Norozi et al., 2021).

On the other hand, there are important macroeconomic factors that can lead to large economic changes in financial markets, especially banks. The most important of these factors are the growth of the gross domestic product and the growth of the consumer price index of goods and services or the inflation rate. Therefore, in this study GDP growth and provincial inflation were used as the most important factors of supply of banking facilities in the macroeconomic sector (Sharma, P. and Gounder, 2012; Cucinelli, 2013; Rabab'ah, 2015; Rachman et al., 2018; Ahmed et al., 2021).

Another important factor influencing the supply of payment facilities is the monetary policy of the Central Bank. In this regard, one of the most important factors directly determined by the central bank of different countries is the interest rate of banking facilities. The interest rate of bank facilities is one of the most common tools of monetary policy (Arbabian et al., 2020). Interest rate is an important monetary policy tool to investigate factors affecting agricultural bank facilities in Iran's provinces. In accordance with the studies on interest rate as a factors determining granting policies also regarding the literature of interest rate studies about factors determining the granting of facilities, this study used the interest rate parameter as an important monetary policy tool.

In the following, the most important related studies that have been done in Iran and abroad are stated in order.

Taghavi and Lotfi (2006) investigated the effect of monetary policy on loans, liquidity

and the volume of deposits in the banking system in the country during the years 1995-2003. The results showed that the monetary policy index in this study which has the legal deposit rate has a negative but very little effect on the growth of bank deposits and lending facilities. In other words, reducing the rate of legal deposit will increase the amount of deposits and facilities granted by banks.

Olivero et al (2011) investigated the link between macroeconomic uncertainty and lending in Ukrainian banks. The results indicate that there is a negative relationship between macroeconomic uncertainty (consumer inflation, producer and money supply uncertainty) and the ratio of bank loans to capital parameter. In this way, banks increase their lending ratios when macroeconomic uncertainty decreases. The banks' reactions to changes caused by uncertainty are not the same, and depend on the properties of banks such as size, profitability. Smaller banks are less able to change their behavior in response to changes in monetary policy. Moreover, monetary policy uncertainty is more affecting profitable banks due to their lending behavior.

Tari et al (2012) in a paper analyzes the relationship between real-sector production and lending behavior of Turkish commercial banks in asymmetric information conditions. This study investigates the dynamic relationship between bank credit facilities and nominal interest rate, volume of non-current materials, and difference in interest rate of loan with deposit interest rate, inflation rate and industrial production index. The results of their study indicate that the rate of inflation and interest rate vary with the interest rate of the loan and the specific level of interest rate are effective on loans offered by banks. Non-current demands are affected by nominal interest rates, but do not directly affect bank lending behavior. The facilities granted by banks also affect the real sector's production.

Brei and Schclarek (2013) analyzed the amount of lending in private and state banks during financial shocks in 50 countries between 1994 and 2009. The results of this study showed that the rate of bank loan supply in government banks is higher than that of private banks during the financial crisis due to the increase in liquidity.

Said (2013) investigated the dynamics of the supply channel of bank facilities in Malaysia during the period from 1999 to 2007, using data from the Panly 23 Bank of Malaysia. The results

of his study showed that monetary policy has important effects on the average rate of bank lending in the country; The Malaysian banks have the ability to set their prices in the mortgage supply, as they are affected by market rate changes and policy rates. The results of his study also show that the increase in the risk leads to an expansion in the stock bond and loan supply. This leads to a strong correlation with the average mortgage rate.

Amini Asl (2014) in a study using the Co-integration and ARDL and 1971-2011 period data, investigated factors such as economic instability on the supply of facilities in Iran. He found that economic instability had an adverse effect on the granting of facilities to government banks in the long run. Moreover, granting of government facilities in Iran has a direct relationship with a deposit-to-asset ratio in the long run but there was no significant relationship in the short run.

Rabab'ah (2015) reviewed factors affecting the granting of facilities to commercial banks in Jordan. In this study, using data from 2005-2013 and data panel co-integration method and various factors of extravasation, domestic variables of banks, monetary policy and macro economy, the percentage of deposits, lending interest rate, the interest rate of deposits, the rate of legal reserves and the rate of inflation have no significant relationship with the granting of facilities in this country, but non-current loans to total loans and significant negative effect on liquidity and economic growth and the size of banks and the positive effect of lending and the rate of facilities in Jordan.

Shahchera and Taheri (2016) investigated the Monetary Policy Transition Mechanism for Bank Lending of Iran for 18 banks in the country for the period 2006-2013, using panel data. The results indicate that the base variables of capital and liquidity and bank size have a significant effect on the lending rate of Iran's banking network. Moreover, these effects increase with the use of monetary policy. In fact, the traditional bank loan channel and the bank's investment channel for the Iranian banking network were approved, although its impact was limited.

Zamanian and Ohadi (2016) In a study, factors affecting the allocation of credits to agricultural activities in Sirjan city were investigated. In this study, through collecting questionnaire data and reviewing customer records from 2010 to 2013 and probit econometric method, we found that variables such as age, education, value of property

and monthly income of applicant have inverse relationship with bank credits and gender variable and have a direct and significant relationship with the lack of possibility of repayment of bank credits.

Mehrar and Khodadad (2017) in the study of the effects of macroeconomic fluctuations on lending behavior of Iranian commercial banks during the period 1974-2015 using the Autoregressive Econometric Model with Distributive Interruption (ARDL) showed that lending of commercial banks (loan to bank assets ratio) is related to output fluctuations during long-term trading periods. It is also associated with increased financial assets of commercial banks. The monetary base is also unable to increase bank lending ability (in terms of the loan-to-asset ratio), and in the long run it will decrease even a small amount.

Sanfilippo-Azofra et al (2018) in a study assessed the relationship between banking facilities and financial development in banks of 31 developing countries for 2000-2012 using the GMM method. Their study showed that countries suffering from system weakness, the process of lending in those countries is not affected by monetary policies. However, in developing countries with a sound financial system, lending in their banks is affected by monetary policy.

Alalaya & Ahmad (2020) assessed factors affecting the performance of 21 banks from commercial banks in Jordan using data from 2008 to 2018 and panel data method. The variables they selected to describe the performance of banks in the country such as unemployment ratio, GDP per capita, inflation rate, interest rate, capital efficiency, liquidity and bank size explained 64% of the performance of banks on average.

Arbaban et al (2020) investigated the impact of monetary sector development on the supply of financial facilities to private, public and Article 44 banks. Using the seemingly unrelated equation system (SUR) and the data from the 2011-2017 period, they found that monetary development has a positive and significant effect on the supply of facilities studied banks. In addition, other variables such as GDP and bank size have positive and significant effect and interest rate have negative and significant negative effects on the supply of facilities to banks.

Chen and Lu (2021) in a recent study examined the factors affecting macroeconomic performance in banks in different cities of China. Using data

from commercial banks in 2005-2014 and FDI, they found that there is a positive and strong correlation between GDP per capita and urban growth in this country with the performance of commercial banks.

Golizadeh et al. (2021) conducted a research entitled identifying key factors affecting banking resource equipping and providing an adaptive model. In this study, Iranian banks and Islamic banks were compared between 2012-2019 and 2012-2019 and GMM econometric methods, respectively. The results showed that indicator of legal deposit rate, non-current demand, inflation and exchange rate have negative and significant effects. Stock return and return on capital and asset return, GDP, investment deposit and loan interest deposit have positive and significant effects on equipping of banking resources in Iran and International banks.

Materials and methods

Since in this study, a self-explanation model with non-linear distributed lag (NARDL) is used to investigate the effects of independent variables on credit supply, so in this part, first the pattern of sub-description based on the variables used in this paper, and then the related information collection variables are introduced. To investigate the asymmetric relationships between economic variables in the short-term and long-term from the model of Shin et al. (2014), through the development of the linear auto regressive distribution lag model with its asymmetric mode, i.e. the model with non-linear auto regressive distribution lag (NARDL) is formed, used.

Nonlinear ARDL is an extended form of ARDL model. NARDL is a new approach used to specify the long-run and short-run asymmetrical relationship between the economic variables. The asymmetries form the non-linear relationships. The NARDL model has the ability to dynamically model aggregation and asymmetry compared to other linear and traditional econometric methods (Zhu et al., 2022). Based on the economics literature and the empirical studies, we can propose the following model to investigate the independent variables on credit supply.

$$GF_t = \beta_0 + \beta_1 NCR_t + \beta_2 IR_t + \beta_3 INF_t + \beta_4 GDPG_t + \beta_5 BS_t + u \quad (1)$$

Where; GF indicating the supply of facilities and bank credits (dependent variable), NCR indicating non-current receivable, IR indicating the interest rate of banking facilities of the Agricultural Bank in Iran, INF the inflation

rate of the provinces, $GDPG$ the growth of Iran's gross domestic product and BS indicating the size of the bank (the ratio of the assets of the Agricultural Bank to the total bank assets in the province).

The asymmetric long-run relationship without a constant term can be represented as:

$$GF_t = B_1^+ NCR_t^+ + B_1^- NCR_t^- + \beta_2^+ IR_t^+ + \beta_2^- IR_t^- + \beta_3^+ INF_t^+ + \beta_3^- INF_t^- + \beta_4^+ GDPG_t^+ + \beta_4^- GDPG_t^- + \beta_5^+ BS_t^+ + \beta_5^- BS_t^- + u_t \quad (2)$$

In the above relationship, positive and negative beta coefficients (β_i^+ and β_i^-) are long-term asymmetric coefficients of independent variables. In equation (2), partial sum of positive and negative changes of variables is shown with positive and negative signs, respectively. For example, the positive and negative changes of the NCR variable are defined as follows:

$$NCR_t^+ = \sum_{i=1}^t \Delta NCR_t^+ = \sum_{i=1}^t \max(\Delta NCR, 0) \\ NCR_t^- = \sum_{i=1}^t \Delta NCR_t^- = \sum_{i=1}^t \min(\Delta NCR, 0) \quad (3)$$

Equation 2 can be rewritten as a NARDL model in the form of error correction (ECM) as follows:

$$\Delta GF_t = \alpha + \lambda_1 GF_{t-1} + \lambda_2^+ NCR_{t-1}^+ + \lambda_2^- NCR_{t-1}^- + \lambda_3^+ IR_{t-1}^+ + \lambda_3^- IR_{t-1}^- + \lambda_4^+ INF_{t-1}^+ + \lambda_4^- INF_{t-1}^- + \lambda_5^+ GDPG_{t-1}^+ + \lambda_5^- GDPG_{t-1}^- + \lambda_6^+ BS_{t-1}^+ + \lambda_6^- BS_{t-1}^- + \sum_{j=1}^{k_1} \gamma_{1j} \Delta GF_{t-j} + \sum_{j=0}^{k_2} \gamma_{2j}^+ \Delta NCR_{t-j}^+ + \sum_{j=0}^{k_2} \gamma_{2j}^- \Delta NCR_{t-j}^- + \sum_{j=0}^{k_3} \gamma_{3j}^+ \Delta IR_{t-j}^+ + \sum_{j=0}^{K_3} \gamma_{3j}^- \Delta IR_{t-j}^- + \sum_{j=0}^{K_4} \gamma_{4j}^+ \Delta INF_{t-j}^+ + \sum_{j=0}^{K_4} \gamma_{4j}^- \Delta INF_{t-j}^- + \sum_{j=0}^{K_5} \gamma_{5j}^+ \Delta GDPG_{t-j}^+ + \sum_{j=0}^{K_5} \gamma_{5j}^- \Delta GDPG_{t-j}^- + \sum_{j=0}^{K_6} \gamma_{6j}^+ \Delta BS_{t-j}^+ + \sum_{j=0}^{K_6} \gamma_{6j}^- \Delta BS_{t-j}^- + \varepsilon_t \quad (4)$$

In equation (5), the coefficients ($\lambda_1, \lambda_2^+, \lambda_2^-, \lambda_3^+, \lambda_3^-, \lambda_4^+, \lambda_4^-, \lambda_5^+, \lambda_5^-, \lambda_6^+, \lambda_6^-$) represent long-term coefficients, and the coefficients ($\gamma_1, \gamma_2^+, \gamma_2^-, \gamma_3^+, \gamma_3^-, \gamma_4^+, \gamma_4^-, \gamma_5^+, \gamma_5^-, \gamma_6^+, \gamma_6^-$) represent short-term coefficients and ε_t is the error term.

The statistics and information of the variables were collected using the Central Bank's time series database, economic indicators, Iran Statistics Center, and the financial statements and balance sheets of agricultural banks of different provinces for the period 2007 to 2020.

Results and discussion

In the first step, the stationarity test of research variables was taken into consideration. In other words, according to the nature of the time series of the variables and in order to avoid any errors in the way of estimating the patterns, the sum of the variables' dependence should be determined. Therefore, the usual tests of panel data, including Fisher-Dickie-Fuller Generalized (F-ADF), Im-Sons-Shin (IPS) and Levin-Lin-Chu (LLC) were used. But in order to check the presence of non-linear unit root, relevant tests were performed. The results can be seen in Table 1. It is clear that all the variables have a single root and are stationary in the first difference. Therefore, all three tests suggest the sum of degrees of dependence of one or I(1).

Moreover, the presence of nonlinear behaviors in the research data were investigated using Yukar-Ama and Amir Mahmoud Aghlu-Amay test. According to the results of the Table 2, the presence of non-linear root in all variables has been confirmed. Therefore, in modeling the relationships between variables it is necessary to pay attention to this important finding and avoid using linear patterns. Hence, taking into account the non-stationary variables and the non-linear effects on the variables, it is possible to examine the relationships between research variables in the long term.

Following the preliminary investigations, an attempt was made to estimate the self-explaining pattern with extensive non-linear interruptions (NARDL). The results of the estimates are reported in Table 3.

Moreover, the positive momentum coefficient of bank in the long run is the highest among all factors. More accurate expression, one percent increase in positive bank size shock would result in a 32.0 percent increase in Agricultural Bank credit supply. In other words, horizontal development of bank in terms of branches increase and investments in modern banking technologies that are considered as an asset increase was the most important factor in increasing the credit supply in Keshavarzi Bank during the period.

GDP growth is the second most important long-term

Result	F-ADF		IPS		LLC		
	First difference	Level	First difference	Level	First difference	Level	
I(1)	-7.55*	-1.43	-4.40*	-0.23	0.82	0.82	GF
I(1)	-5.67*	-1.63	-3.36*	-0.44	0.62	0.62	NCR
I(1)	-5.32*	-1.97	-5.97*	-0.63	-0.75	-0.75	IR
I(1)	-6.99*	-1.56	-4.63*	-1.29	-1.11	-1.11	INF
I(1)	-5.18*	-2.82	-5.33*	-0.98	-0.91	-0.91	GDPG
I(1)	-6.64*	-0.89	-3.19*	-1.01	-0.65	-0.65	BS

Note: Variables are in natural logarithm. * Significant at 10% level

Source: Authors computation

Table 1: The results of the stationarity test of the variables.

	Non-linear unit root		Symmetric nonlinear unit root
	UO	EO	EO
GF	-1.01**	4.25***	1.01
NCR	-1.52***	5.32***	1.23
IR	-1.34***	4.94***	1.11
INF	-2.12***	5.64***	1.19
GDPG	-1.61***	5.39***	1.21
BS	-1.73***	4.75***	1.53

Note: **and*** are significant at 5 and 1 percent levels, respectively.

Source: Authors computation

Table 2: Nonlinear unit root test results.

coefficient. More precisely, a percentage increase in positive momentum of this variable leads to an increase in credit supply by 0.28% in the long run. The same coefficient for the negative momentum of this variable is estimated to be -0.19. Provincial inflation is identified as the third most influential variable in table (3). Although this association may at first look attractive and considerable, the fact is that the increase in the supply of facilities due to higher inflation does not necessarily mean the growth of the real indicators of the agricultural sector, because as a result of the increase in the general level of prices (which is associated with inflation in different commodity groups based on causal relationships) farmers need more facilities to meet their constant needs and thus the value of the bank's facilities rises without bringing the output boom. Investment in the sector or business development, on the other hand, requires financing more. On the other hand, inflation can result in more pressure on the government to provide subsidized comfort facilities.

According to the results, the bank's non-current receivable can only have a negative impact on the supply of credit. The long-run positive momentum coefficient of this variable is -0.18. In the analysis of this result, it can be said that as the amount of non-current demand of a bank in the previous period increases, it will create a lot of difficulties for banks. One of the main problems and obstacles that will create for banks is that it will reduce the power of bank facilities to be paid by banks and financial institutions in the coming period.

Moreover, the positive momentum coefficient of interest (IR) is estimated to be 0.04 in the long run. Although the increase in facility productivity is the basis of more propensity and desire by KESB to offer facilities, it should be mentioned in full coordination with the national interest rate and inflation, and the Agricultural Bank should seek to reduce margin of profit by improving productivity (difference between the facility interest rate and the deposit profit rate). Moreover, a significant portion of the Bank's facilities are allocated in the form of Comment (subsidized) facilities to strengthen the infrastructure of the agricultural sector; an increase in the rate of such facilities will actually mean an increase in the government's burden of spending. Therefore, proposal increase of utility rates as a factor for extending the supply of facilities to be considered.

Wald's test is used as an estimate to investigation the symmetry or asymmetry of positive and negative shocks of the variables. The results of this test are

shown in table 4. The null hypothesis in Wald's test is based on the symmetrical effect of positive and negative shocks. According to the obtained results, the null hypothesis of this test is rejected for all variables at the 5% error level. hence, indicates that the positive and negative shocks of the variables have asymmetric effects on GF of the Bank of Agriculture in Iran.

Variable	Long-term		Short-term	
	Coefficient	Probability	Coefficient	Probability
NCR ⁺	-0.18	0.03	-0.07	0.04
NCR ⁻	0.05	0.11	0.08	0.07
IR ⁺	0.04	0.14	0.02	0.09
IR ⁻	-0.08	0.12	-0.01	0.12
INF ⁺	0.23	0.03	0.03	0.05
INF ⁻	-0.15	0.06	-0.04	0.05
GDPG ⁺	0.28	0.01	0.08	0.03
GDPG ⁻	-0.19	0.02	-0.11	0.02
BS ⁺	0.32	0.07	0.09	0.08
BS ⁻	0.06	0.09	0.07	0.11
ECT(-1)	-	-	-0.54	0.03

Source: Authors computation

Table 3: Long-term and short-term coefficients in estimated NARDL model.

Variable	Long-term	Short-term
	Chi-square statistic (probability)	Chi-square statistic (probability)
NCR	9.56 (0.02)	8.23 (0.04)
IR	1.25 (0.03)	1.42 (0.04)
INF	8.62 (0.02)	1.36 (0.02)
GDPG	7.91 (0.04)	6.28 (0.04)
BS	7.43 (0.04)	1.97 (0.01)

Source: Authors computation

Table 4: The results of the test of asymmetry in the effects of variables.

Conclusion

As one of the specialized banks active in Iran's economy, Agricultural Bank plays an undeniable role in financing agricultural activities on the one hand and implementing government support policies (such as guaranteed purchase and agricultural insurance) on the other hand. Due to the expansion of agricultural activities throughout the country and the development of related industries in recent decades, the demand for loans granted by the said bank has increased.

So that during the studied period in the agricultural sector, the Bank of Agriculture has paid loans in the amount of 22 thousand trillion Rials.

Considering the different needs of different provinces for bank loans, due to the difference in the volume, composition and type of agricultural activities, the identification and analysis of factors affecting the supply of facilities based on provincial panel data was considered in this study. In this regard, the data of the period 2007 to 2020 and the self-explanatory model with a wide non-linear interval based on panel data have been used. Based on the investigations and tests, the existence of a non-linear relationship between the independent variables and the dependent variable (credit supply) was confirmed. In other words, positive and negative impulses have different effects on credit supply and it is necessary to estimate these two effects separately.

The results of the estimation model showed that the bank size variable (the ratio of agricultural bank assets to total bank assets at provincial levels) was the most important driver of credit supply in the period under review. Based on this, the bank's policy of expanding horizontally and increasing the number of branches in cities and rural areas (which is an example of increasing assets) along with the slogan "Agricultural Bank, the Bank of All People of Iran" which has been an important factor in attracting capital and equipping the bank's resources (and naturally has improved the capacity to supply facilities), has been able to have a positive and significant effect on the injected credits to the agricultural sector. Of course, it should be noted that the estimated long-term and short-term positive momentum coefficients (0.32 and 0.09) were actually the average effect for all provinces in the study period. Based on this, it is recommended to increase investment in the field of new banking technologies and try to create transformation in sync with the developments of the international banking system (which is a kind of asset increase and also helps to improve productivity).

GDP growth was identified as the second variable in terms of intensity of impact. Naturally,

the real growth of the economy is a factor for the improvement of banking performance indicators and therefore it is expected to have a positive effect on the injection of more credits. The provincial inflation rate has also had a positive and significant effect. The increase in the general level of prices has actually led to an increase in the cost of production, and therefore, in order to meet the demand for credits, the volume of granted facilities has also increased. As mentioned, this effect, contrary to what may appear on the surface, does not necessarily mean a positive effect on the actual production of the agricultural sector, and perhaps the volume of facilities has increased to maintain the previous level of production.

The interest rate of the facility has also shown a direct and significant effect on the supply of credits (long-term and short-term). Considering the important role of the Agricultural Bank in providing low-cost facilities for agricultural activities, the proposal to increase the interest rate of the facility as a factor for increasing the supply of credits should be raised with caution, because it will actually mean an increase in the financial burden of the government (in case of no change in the interest rate of the facility) or an increase in the cost of production, or both.

Based on the obtained results, non-current receivable is the only variable with an inverse (indirect) effect. Available statistics and information show that the volume of doubtful and overdue claims in the Bank of Agriculture is at a high level. It is obvious that non-repayment of granted facilities practically limits the capacity of injecting resources and responding to credit demand. Therefore, it is recommended that the Agricultural Bank in Iran, put the control of non-current receivable in a more effective way (especially through the detailed examination of the neediest borrowers and desirable characteristics of the recipients of the facilities, including their qualifications.) in its policy priorities and in this way, reducing the credit risk, and provide more effective services in the financing of the agricultural sector.

Corresponding author:

Farzin Feizizad, Ph.D.

Islamic Azad University

Tehran Branch, Pasdaran Ave. 9, Tehran, Iran

Email: farzin_cs@yahoo.com

References

- [1] Ahmed, S., Majeed, M. E., Thalassinou, E. and Thalassinou, Y. (2021) "The impact of bank specific and macro-economic factors on non-performing loans in the banking sector: evidence from an emerging economy", *Journal of Risk and Financial Management*, Vol. 14, No. 5. ISSN 1911-8074. DOI 10.3390/jrfm14050217.
- [2] Alalaya, O. M. and Ahmad, A. (2020) "Performance of commercial banks profitability in Jordan (2005–2019)", *South Asian Research Journal of Business and Management*, Vol. 2, No. 3, pp. 70-82. ISSN 2664-3995. DOI 10.36346/sarjbm.2020.v02i03.006.
- [3] Almazari, A. A (2014) "Impact of Internal Factors on Bank Profitability: Comparative Study between Saudi Arabia and Jordan", *Journal of Applied Finance & Banking*, Vol. 4, No. 1, pp. 125-140. ISSN 1792-6580.
- [4] Amini Asl, E. (2014) "The effect of macroeconomic instability on the lending behavior of Government banks in Iran", Master's Thesis, University of Sistan and Baluchestan. [Online]. Available: <https://www.virascience.com/thesis/680499/> [Accessed: Sept. 15, 2024] (In Persian).
- [5] Arbabian, Sh., Ghasemy, M. R. and Beiraghdar, S. (2020) "The Impact of Monetary Sector Development on Iranian Banks' Loan Supply", *Journal of Monetary and Banking Research*, Vol. 12, No. 42, pp. 577-600. ISSN 2645-3355. (In Persian).
- [6] Awad, I. M. and Al Karaki, M. S. (2019) "The impact of bank lending on Palestine economic growth: an econometric analysis of time series data", *Financial Innovation*, Vol. 5, No. 1, pp. 1-21. ISSN 2199-4730. DOI 10.1186/s40854-019-0130-8.
- [7] Bakhtiari, S. and Shayesteh, A. (2012) "Investigating the impact of improving the business environment on economic growth in selected countries with an emphasis on Iran", *Journal of Financial Economics*, Vol. 19, pp. 175-204. ISSN 2538-3833. [Online]. Available: <https://sanad.iau.ir/fa/Journal/ecj/Article/1063157> [Accessed: June 5, 2024]. (In Persian).
- [8] Banga, S. (2013) "Socio-Economic significance of commercial banks in India: with special emphasis on public sector banks", *International Journal of Advanced Research in Management and Social Sciences*, Vol. 2, No. 1, pp. 1-22. ISSN 2278-6236.
- [9] Brei, M. and Schclarek, A. (2013) "Public bank lending in times of crisis", *Journal of Financial Stability*, Vol. 9, No. 4, pp. 820-830. ISSN 1572-3089. DOI 10.1016/j.jfs.2013.01.002.
- [10] Chen, X. and Lu, C. C. (2021) "The impact of the macroeconomic factors in the bank efficiency: evidence from the Chinese city banks", *The North American Journal of Economics and Finance*, Vol. 55, p.101294. ISSN 1062-9408. DOI 10.1016/j.najef.2020.101294.
- [11] Chernykh, L. and Theodossiou, A. K. (2011) "Determinants of bank long-term lending behavior: Evidence from Russia", *Multinational Finance Journal*, Vol. 15, No. 3/4, pp. 193-216. ISSN 1096-1879. DOI 10.17578/15-3/4-2.
- [12] Cucinelli, D. (2013) "The Determinants of Bank Liquidity Risk within the Context of Euro Area", *Interdisciplinary Journal of Research in Business*, Vol. 2, No. 10, pp. 51- 64. ISSN 2046-7141.
- [13] Golizadeh, H., Bagherzadeh, M., Mehrara, A., Golipour, Y. and Shahchera, M. (2021) "Comparative study of effective factors on equipping banking resources and model presentation", *Journal of Financial Economics*, Vol. 15, No. 55, pp. 133-154. ISSN 2538-3833. (In Persian).
- [14] Hacievliyagil, N. and Eksi, I. H. (2019) "A micro based study on bank credit and economic growth: Manufacturing sub-sectors analysis", *South East European Journal of Economics and Business*, Vol. 14, No. 1, pp. 72-91. ISSN 2233-1999. DOI 10.2478/jeb-2019-0006.
- [15] Imran, K. and Nishat, M. (2013) "Determinants of bank credit in Pakistan: A supply side approach", *Economic Modelling*, Vol. 35, pp. 384-390. ISSN 0264-999. DOI 10.1016/j.econmod.2013.07.022.
- [16] Mehrar, M. and Khodadadi, F. (2017) "Effect of macroeconomic fluctuations on the lending behavior of commercial banks in Iran", *Journal of Islamic Economics & Banking*, Vol. 6, No. 18, pp. 23-39. ISSN 2345489x. [Online]. Available: <http://mieaoi.ir/article-1-452-en.html>. [Accessed: June 5, 2024]. (In Persian).

- [17] Mishkin, F. S. (2013) "*The Economics of money, banking, and financial markets (13th ed.)*", Pearson Education, New York. ISBN-13 978-0321062734, ISBN-10 0321062736.
- [18] Norozi, M., Esfandiarpour, M. and Shasavar Poor, R. (2021) "Identifying and Ranking the Factors of Increasing Non-current Receivables in Public Banks, Subject to Principle 44 and Private Banks in Iran", *Quarterly Journal of Islamic Finance and Banking Studies*, Vol. 7, No. 16, pp. 43-76. ISSN 2588-3569. DOI 10.22034/jifb.2022.153327.
- [19] Olivero, M. P., Li, Y. and Jeon, B. N. (2011) "Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America", *Journal of Banking & Finance*, Vol. 35, No. 3, pp. 560-571. ISSN 0378-4266. DOI 10.1016/j.jbankfin.2010.08.004.
- [20] Rabab'ah, M. (2015) "Factors affecting the bank credit: An empirical study on the Jordanian commercial banks", *International journal of Economics and Finance*, Vol. 7, No. 5, pp. 166-178. ISSN 1916-971X. DOI 10.5539/ijef.v7n5p166.
- [21] Rachman, R. A., Kadarusman, Y. B., Anggriono, K. and Setiadi, R. (2018) "Bank-specific factors affecting non-performing loans in developing countries: Case study of Indonesia", *The Journal of Asian Finance, Economics and Business*, Vol. 5, No. 2, pp. 35-42. ISSN 2288-4637. DOI 10.13106/jafeb.2018.vol5.no2.35.
- [22] Said, F. F. (2013) "The dynamic of bank lending channel: Basel regulatory constraint", *Economic Modelling*, Vol. 31, pp. 606-613. ISSN 0264-9993. DOI 10.1016/j.econmod.2013.01.003.
- [23] Sanfilippo-Azofra, S., Torre-Olmo, B., Cantero-Saiz, M. and López-Gutiérrez, C. (2018) "Financial development and the bank lending channel in developing countries", *Journal of Macroeconomics*, Vol. 55, pp. 215-234. ISSN 0164-0704. DOI 10.1016/j.jmacro.2017.10.009.
- [24] Shahchera, M. and Taheri, M. (2016) "Impact of off-balance Sheet Banking on the Bank Lending Channel of Monetary Transmissio", *Quarterly Journal of Economic Research and Policies*, Vol. 24, No. 78, pp. 145-170. ISSN 1027-9024. [Online]. Available: <http://qjerp.ir/article-1-1172-en.html>. [Accessed: June 14, 2024]. (In Persian).
- [25] Sharma, P. and Gounder, N. (2012) "Determinants of bank credit in small open economies: The case of six Pacific Island Countries", 16 p. SSRN. DOI 10.2139/ssrn.2187772.
- [26] Shin, Y., Yu, B. and Greenwood-Nimmo, M. (2014) "Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework", In: Sickles, R. C. and Horrace, W. C. (eds), "*Festschrift in honor of Peter Schmidt: Econometric methods and applications*", pp. 281-314. ISBN 978-1-4899-8007-6. DOI 10.1007/978-1-4899-8008-3_9.
- [27] Taghavi, M. and Lotfi, A. A. (2006) "Investigating the effects of monetary policy on the volume of deposits, granted facilities and liquidity of the country's banking system (during the years 1994-2002)", *Economic Research*, Vol. 6, No. 20, pp. 131-165. ISSN 1735-210X. (In Persian).
- [28] Tari, R., Yiğitbaş, Ş. B. and Kurt, S. (2012) "Asimetrik Bilgi, Banka Kredileri ve Reel Sektör Arasındaki İlişkilerin Ampirik Analizi", *Gaziantep University Journal of Social Sciences*, Vol. 11, No. 4. ISSN 1303-0094.(in Turkish).
- [29] Zamanian, Gh. and Ohadi, N. (2016) "Identification Factors Affecting on Agricultural Credits Allocation (Cease Study: Pistachio Growers in Sirjan)", *Iranian Journal of Agricultural Economics and Development Research*, Vol. 47, No. 2, pp. 303-311. ISSN 2008-4838. DOI 10.22059/ijaedr.2016.59704. (In Persian).
- [30] Zhu, X., Niu, Z., Zhang, H., Huang, J. and Zuo, X. (2022) "Can gold and bitcoin hedge against the COVID-19 related news sentiment risk? New evidence from a NARDL approach", *Resources Policy*, Vol. 79, pp. 1-12. ISSN 0301-4207. DOI 10.1016/j.resourpol.2022.103098.