



Research Paper

## Bank Lending Channel Reaction to Financial Suppression Policies

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### ARTICLE INFO

#### Article history:

Received 2020-10-22

Accepted 2021-06-21

#### Keywords:

lending channel

financial repression

monetary policy transmission

mechanism

### ABSTRACT

Iran's economy has been suffering from the dominance of fiscal policies and financial repression for many years, so that this issue has become one of the structural challenges of the country's economy. Banks, as one of the most important parts of macroeconomics, play an important role in the mechanism of transferring monetary policy to the real sector of the economy. Monetary policy transmission operates through various channels: the lending channel, the balance sheet channel, and the capital channel. Examining how the role of banks in monetary policy transmission is affected by government fiscal repression policies provides useful information for monetary and financial policymakers and banking activists. In this study, we tried to investigate the effect of financial repression on the monetary policy transmission through the lending channel of the country's banks. First, an indicator for the financial repression variable was defined using the PCA method, and then the relationship was estimated using the SVAR method and instantaneous response functions and using seasonal data for the period 1999-2017. The results show that financial repression policies have a significant effect on bank lending and reduce banks' lending power. This issue, along with the negative real interest rate of bank facilities, causes a decrease in the profitability index and loss of banks.

## 1 Introduction

After the global financial crisis of 2007 and questioning the role of banks in financing the private sector, the banks' lending channel was reconsidered [56]. Nowadays the banking system plays a key role in monetary policy transmission [42]. In the economic literature, the monetary policy transmission that operates through banks is called the banks' lending channel [44]. The lending channel is defined as offering bank loans to the private sector [48]. Since deposits and other financing methods are incomplete substitutes for each other, with the increase of interest rates (contractionary policy), the liquidity of banks is limited and the supply of loans decreases, reducing investment costs and finally consumption expenditures followed by a decrease in economic activities [44, 71]. In addition to contractionary policies, there are other factors that affect the liquidity of banks and then the lending of banks. These include regime change, exchange rate fluctuations, banks' speculative behavior, and government financial repression policies. In a practical definition, financial repression is the existence of various obstacles to

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financial activities such as interest rate ceilings, orderly reduction of interest rates independent of inflation, selective allocation of credit, and enforcement policies to funds intermediaries to allocate resources apart from the conventional validation mechanism, high reserve requirement ratio and etc. [7]. Paying attention to the annual budget bills and programs shows that fiscal policy through the implementation of tasks such as determining the exchange rate, creating new credit lines, and credit obligations on the banking network, including forcing banks to buy government and state-owned companies and depositing these bonds with banks, forcing banks to pay facilities to factories, housing purchase facilities, payment of Qard al-Hasan facilities, setting limits for accepting certain types of bank collateral such as agricultural, rural and housing collateral, numerous rulings on deferral or deferral of debts and non-current loan facilities recipients have caused financial constraints of banks and inefficiency of the banking system and increased the volume of overdue receivables [61]. In this article, we seek to examine the impact of financial repression policies on the monetary policy transmission mechanism in the area of the lending channel.

The monetary policy transmission mechanism is one of the most widely used topics in the field of monetary policy, which is interpreted as a black box [15] and several studies have been conducted in this field. The Great Depression of 1929 showed a significant relationship between financial markets and economic activity and fiscal policy, and as financial friction increased, the credit market would transmit the impact of these shocks to the economy non-linearly [16,27]. In Iran country, despite numerous studies in the field of monetary policy transmission mechanism, the role of government financial repression policies in monetary policy transmission and lending channel have not been addressed. Seeing the ups and downs of the banking system in recent years and the financial bottlenecks facing institutions and banks, the need to address this issue seems more necessary than ever. To answer this question, in the second part, we will deal with the theoretical foundations and literature of this subject. In the third part, the methodology of the study is presented and in the fourth part, the results of statistical estimations are presented. The final section will include a conclusion.

## 2 Literature Review

Central banks use direct and indirect instruments such as reserve ratio, credit lines, facility ceilings, open market operations, central bank participation bonds and special deposits of banks with the central bank and re-discount to enforce monetary policy [55, 49]. Monetary policy is a tool for influencing economic variables, but this influence is based on a process. The process of affecting monetary policy on the economy is called the monetary policy transmission mechanism [42]. The mechanism of monetary policy transmission is understood to be the procedure by which decisions and actions of monetary policy authorities are reflected in price levels and income [32]. There are several channels for transferring monetary policy, which can be classified into several main sections: exchange rate channel, interest rate channel, credit channel, asset price channel, capital flow channel, expectation channel and in recent years risk-taking channel [25].

In the credit channel, which is a subset of non-neoclassical approaches to the monetary policy transmission mechanism, assuming that substitute bonds and bank credits are incomplete, and great percentage of individuals and firms are unable to access to any source of finance except bank lending. So because of friction of information, these firms find it extremely expensive to finance through capital market and therefore they depend heavily on bank loans [32]. Three main strategies for influencing monetary policy are used including bank lending channel and balance sheet channel, risk-taking channel [67, 26]. In this article, we examine the mechanism of monetary policy transmission through the lending channel. In

this channel, the process of monetary policy is such that the application of contractionary monetary policy reduces bank deposits and, consequently, reduces bank credit. Decreased bank credit will also reduce investment and lower real output.

$$M \uparrow \rightarrow \text{bank deposits} \uparrow \rightarrow \text{bank loans} \uparrow \rightarrow I \uparrow \rightarrow Y$$

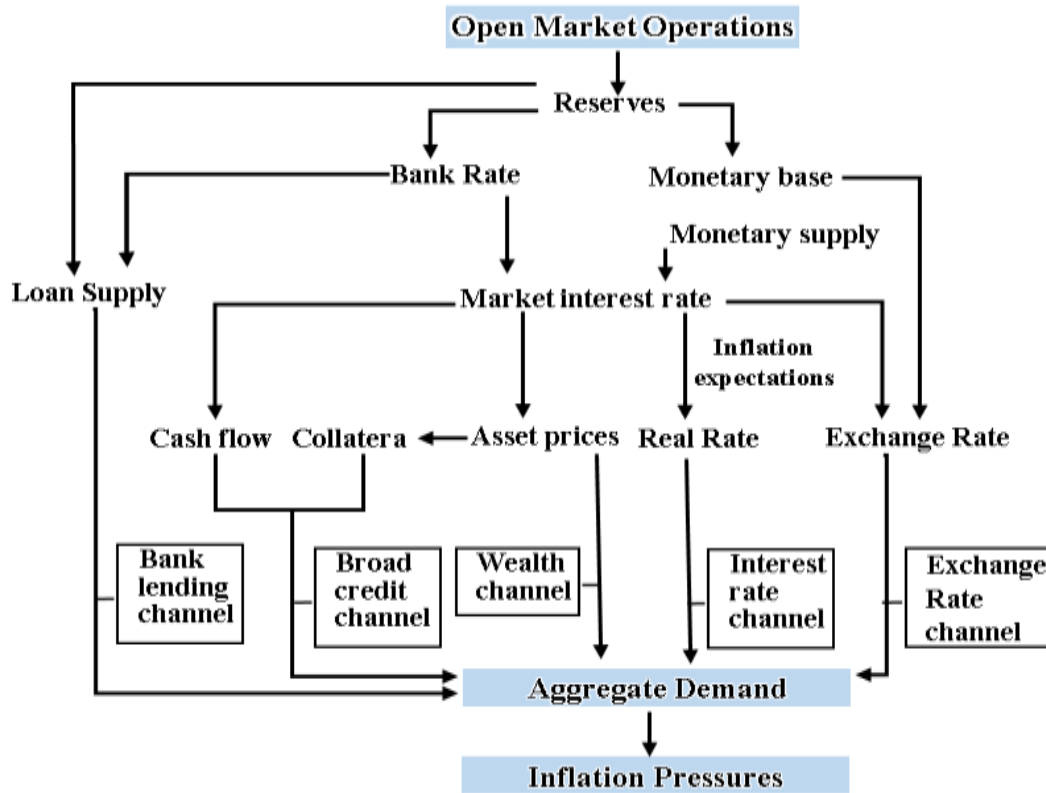


Fig. 1: Monetary policy transmission mechanism

An important feature of the bank lending channel is that changes in monetary policy would influence companies that depend heavily on bank loans as compared to companies that can fund from capital market [32]. At a broad conceptual level, the basic bank lending channel operates as follows. A reduction in central bank policy rate infuses liquidity into the banking system. This greater liquidity from the central bank at lower costs in turn increases the supply of bank credit (from  $S_0$  to  $S_1$ ), leading to a fall in bank lending rates (from  $r_0$  to  $r_1$ ) and a consequent rise in the quantity of bank lending (from  $l_0$  to  $l_1$ )



Fig. 2: Lending channel

Numerous studies have been conducted on the mechanism of monetary policy transmission, but because there is no consensus on its function, it is interpreted as a black box [48, 15]. Regarding the position of monetary policy and diagnostic issues in the credit channel, empirical research on the mechanism of monetary policy transmission faces two main challenges: measuring monetary policy and determining the credit channel. There are problems with determining monetary policy including whether the policy is contractionary or not? Financial innovations and liberalization of the capital account have eroded the relationship between money and aggregate demand in most countries since the 1980s, leading to unsustainable demand for money. Therefore, the focus turned to variables that express the position of monetary policy and can be used as policy tools such as money market interest rates, lending rates, exchange rates and credit volumes. Because the relationship between money and aggregate demand has been eroded, in developed countries, interest rates derived from central bank interaction in the money market are used and expected as a policy tool. This rate changes the level of relative prices and actual activity through a number of channels. According to Bernanke and Blinder [14], the Fed rate and the range between the Fed rate and treasury bills are a good indicator of the position of monetary policy in the United States. Kashyap et al. [35] confirms that the range between premium rates and treasury rates has real predictive power. Romer and Romer [53], on the other hand, used a technique called Romer date to gauge monetary policy stance.

Romer's date showed the exact time of the monetary contraction using federal data. In domestic studies, various criteria have been used to measure monetary policy, which will be discussed in the third part of this study. The second challenge is the problems of determining the channels of independent monetary policy. The first problem is the lack of complete data to test different channels of monetary policy. For example, theoretical models generally use real interest rates instead of nominal interest rates to analyze the relationship between money and real activity while real interest rates are not directly visible in real data. The second problem is that, even if the data are directly visible, empirical inference about monetary policy will not be easy due to the difficulty in discerning the actions of monetary policy officials from the consequences of their decision. Economic entities react, when the economy is weak, they adjust policies and when it is growing, they intensify it. Therefore, it will not be easy to determine the impact of exogenous monetary policy. The third problem is that it is difficult to determine the credit channel experimentally. It is not easy to distinguish between supply-demand dynamics in changes in total credit [72]. Kashyap et al. [35] tried to examine the bank lending channel by considering the impact of supply and demand. Using US data, he showed that the policy of monetary contraction would lead to a shift in the firm's external financing from bank facilities to securities. The decrease in bank loans is due to the decrease in loan supply rather than the decrease in loan demand.

Kashyap et al. [35] showed that the increase in the ratio of commercial securities to the total amount of foreign financing after a contractionary monetary policy can be interpreted as evidence of the existence of a lending channel. Although the demand for foreign financing increases due to the contractionary monetary policy, the decrease in bank loans is more related to the decrease in supply than the demand for loans. In addition, due to the monetary attitude, the rate of loans and facilities will decrease after the decrease in loan demand (which is due to the decrease in production), but in reality, this rate increases during the contraction period. A decrease in bank loans and an increase in commercial securities of non-commercial firms can be seen as evidence of the bank's lending channel, but an increase in the issuance of commercial securities cannot be interpreted as a decrease in loan demand. However, this conclusion does not explain the fact that most of the bonds issued belong to large corporations, not small corpora-

tions, whose tight monetary policy limits their activities through the effects of balance sheets. Experimental research on the credit attitude of the monetary policy transmission used different methods to determine the existence of a credit channel. These studies can be divided into several categories in terms of the method used. A number of studies using general time series data have examined the effect of total credit on investment, production, and consumption using VAR models or other time series techniques. These include the study of Bernanke and Blinder [14], Kashyap et al. [35], Gertler et al. [27]. These studies have used summarized form models as a theoretical basis. The second group of these studies examined the determinants of banks' lending using micro-data inspired by studies that examined the role of financial deficits in investment decisions of non-financial corporations, for example Kashyap et al. [35]. These studies showed that the structure of financial markets is important in determining monetary policy transmission.

For example, banks react differently to monetary shocks depending on their capital structure and other characteristics, and this in turn affects economic activities. In the third group, using the data of the balance sheet panel of non-financial enterprises or households, the importance of financial variables in explaining fixed investment, investment in inventory, consumption and employment is examined. Empirical evidence confirms that investment decisions (fixed or in stock) depend heavily on the firm's financial condition (e.g., domestic funds) as well as macroeconomic conditions. Other studies also examined the relationship in the form of conventional and unconventional monetary policies [7, 9, 22]. Some researches also examined this relationship according to the characteristics of banks including the ratio of bank size, amount of capital and liquidity, and etc. [3, 47, 52, 66, 73, 38]. Since Iran's economy is bank-oriented and according to statistics and indicators published by the Central Bank, a large share of financing the Iranian economy is the responsibility of the country's banking system, the Iranian capital market has not the necessary efficiency to finance enterprises [49]. It is necessary to examine the impact of policies that affect the lending function of banks. In addition to monetary policymakers, financial policymakers' decisions also affect the supply of bank loans.

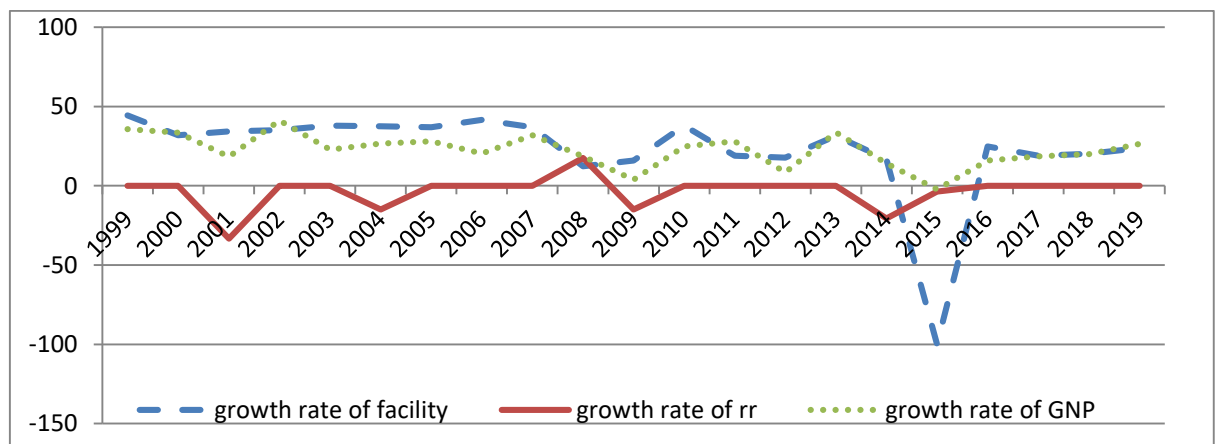


Fig. 3: credit growth, reserve requirement growth and GNP growth

Fig. 3 illustrates the development of the central bank policy rate, credit growth, and economic growth in Iran. Therefore, it seems more necessary to study financial repression and the challenges arising from the dominance of fiscal policies over the lending power of banks. In Iran, several studies have been conducted on the monetary policy transmission and the relationship between monetary and fiscal policies, but no research has been done on the role of financial repression on the lending channel of banks. The innovation of this research is in examining the role of government financial repression policies on

banks' lending channel. The study was anchored on two theories namely financial repression theory, monetary policy transmission mechanism. Xun (2013) suggests that financial repression in developing countries allows governments to tax individual savings at the same rate [2]. The term financial repression was first coined by McKinnon [40]. Observing the involvement of governments in financial markets, he introduced the term financial repression. This repression occurs when governments distort financial markets through taxes or other means. When financial repression occurs, import activities, exports of minerals, supporting industrial products, large international companies and various government institutions and even unusual government budget deficits, seize limited resources from bank deposits, and consequently, other economic financial resources must be provided through insufficient resources of lenders, mortgage owners and cooperatives [45]. The main element of McKinnon-Shaw model, in which financial institutions are intermediaries between savers and investors, is shown in Fig. 4.

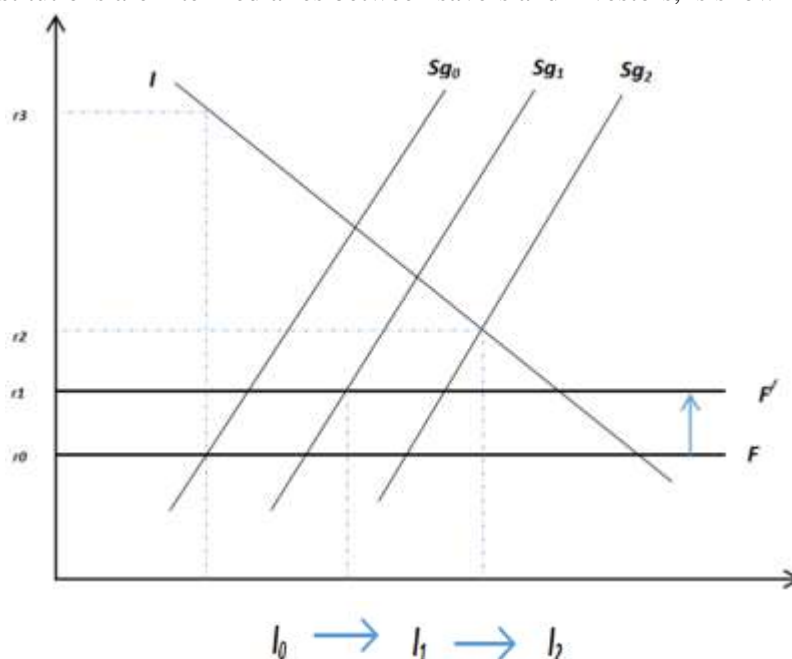


Fig. 4: McKinnon-Shaw model (resource: Abdi Seyyedkolae, M.)

$sg_0$  is the savings chart at the rate  $g_0$  of economic growth and is positively related to the interest rate. Line  $I$  is investment chart and is inversely related to the real interest rate and line  $F$  is financial repression that is below equilibrium interest rate. By applying the policy of financial repression and setting interest rates below the market equilibrium interest rate, the amount of savings will be determined at  $r_0$  and investment will be determined at  $I_0$ . In the event of financial repression, the issue of rationing of lendable resources appears and granting facilities will not be based on the efficiency of the investment project. With the increase of the interest rate ceiling from  $r_0$  to  $r_1$ , the financial repression chart will be transferred from  $F$  to  $F'$  and this cause raising in savings and investment. By raising the interest rate ceiling, investors do not execute the project with a return of less than  $r_1$ , so the average efficiency of the entire investment is increased and the  $I$  curve is transferred to  $I_1$ . Financial repression directly and indirectly affects the bank operations. Directly by reducing the deposits of economic agents in banks and reduces the lending power of banks. Indirectly, by reducing the accumulation

of capital and reducing economic growth, it reduces the income of banks from granting facilities [2]. The study of Iran's financial system shows that Iran's economy has been heavily involved in the phenomenon of financial repression in recent decades [2]. While governments often cite financial repression as a growth-enhancing policy in their analysis, financial repression is, in fact, a method of financing government budget deficits. According to the set of definitions provided, if in a country the government, by enacting a set of restrictive laws and regulations, allocates financial resources of financial intermediaries at a cheap price to selective activities, finances the budget deficit and domestic institutions, and prevents the optimal allocation of financial intermediary resources based on market prices, financial repression has occurred in that country. McKinnon's study had a major impact on academic studies and financial development policies. Since the late 1970s, academic and policy debates about financial institutions in developing countries have almost inevitably focused on the concept of financial repression. A number of development economists found fiscal repression policies appropriate before and during the decade for a variety of reasons, including:

First, they argue that governments need to set interest rates to prevent usury, and therefore intervening in setting interest rates. The second argument is that tighter regulations and controls on the money market make it easier and better for monetary policymakers to control the money supply. Third, governments know better than markets (private banks) what the optimal allocation of savings is or which investments are more socially beneficial. Fourth, financial repression (defined by lower interest rates than conventional market rates) reduces the cost of government debt interest. Researchers have used various indicators to determine the index of financial repression. The most important of these are the rate of reserve ratio of banks for commercial banks, the requirement of financial intermediaries to keep government debt at low interest rates, interest rate ceiling, foreign exchange control, floating exchange rate, foreign borrowing rate, rate currency and its policies, the ratio of bank credits and government expenditures to GDP, the ratio of government debt to GDP, the ratio of public sector debt to GDP, the ratio of domestic debt and government-provided bank credit to GDP and negative interest rate. Taghipour [69] used three variables: interest rate ceiling, precautionary storage requirement of deposits and direct credits using the main analysis method of PCA to construct a financial repression index [6]. Akhlaghi Modiri [6] used the variables of real deposit interest rate, lending facilities of banks and non-bank credit institutions and the ratio of public sector debt to total debt or assets of the banking sector. As mentioned before this study was anchored on two theories: financial repression theory and monetary policy transmission mechanism.

Some studies have been conducted on financial repression in Iranian economy. Fakhri Kondori [26] used six variables defined as virtual variables zero and one (exchange rate, interest rates on deposits, the entry of credit institutions, the entry of private banks, capital market (stock exchange), reserve requirement ratio). Morsali and Darvishi [45] used the three variables of real interest rate, reserve requirement ratio and inflation rate as indicators of financial repression. Ahmadzadeh and Samadipour [5] used the interest rate index as financial repression. Abbasi et al. [1] used six variables: real interest rates on deposits, the ratio of government borrowed facilities to the total balance of facilities granted by the banking system, the ratio of government debt to the banking system to the total debt balance of the banking system, government intervention in the economy (virtual variable), reserve requirement ratio, and the financial variable index of 8 years of war. Shahbazi et al. [61] studied the effect of exchange, monetary and banking provisions and duties of the annual government budgets on the monetary policy and banking system of Iran. By examining the relationship between monetary policy and fiscal policy, they studied the effect of this relationship on bank facilities. Altavilla et al. [9] investigated the mechanism of money transfer under negative interest rate (ZLB). Their study showed that strong banks pass

on negative interest rates to depositors, and the real impact of negative interest rates on corporate investment depends on the composition of firms' assets. Eggertsson et al. [24] examined the effect of negative interest rates on banks' lending channels using data from Sweden. Examining the interaction of the three variables including monetary policy rate, interest rate and lending rate, they showed that when the monetary policy rate becomes negative, the traditional monetary policy transmission mechanism operating through the lending channel is wasted. Their estimates show that with a monetary policy rate of -0.50%, the lending rate will increase by 15% and production will decrease by 7%. Some studies have been conducted on the field of monetary policy transmission mechanism and studied it in different dimensions. For example, In the field of investigating the mechanism of money transfer on macro variables; Komijani et al. [36] examined the effectiveness of four channels: interest rate, exchange rate, asset price (stock) and lending channel using data from 1990-2008. Their results showed that all channels are active in transmitting monetary policy.

Among them, the bank lending channel has the greatest impact on real output growth and the exchange rate channel has the greatest impact on inflation. Sharifi Renani et al. [63] concluded that the increase in money supply, due to the increase in banks' debt to the central bank, is only a factor in increasing the level of production in the short run and has a negative effect in the long run. But the effect of this relationship on the general level of prices is negative, both in the short run and in the long run. Using quarterly data from US commercial banks, Sapriza and Temesvary [58] showed that banks with less liquidity are more affected by monetary policy than their competitors and monetary policy are able to influence prices and economic growth through the money transfer mechanism. Cesa Bianchi et al. [21] examined the effect of monetary policy shocks on macroeconomic variables and financial variables using UK data and showed that monetary contraction policy decreased real activity and CPI, increased pound value and decreased Bank credits. In the field of examining the factors affecting the supply of bank loans; Shirin Bakhsh and Jabbari [64] examined the effect of reserve requirement ratio and the assets of banks on the supply of bank loans. Their results showed that the size of banks asset affects the supply of banks loan, but the required reserve ratio has no significant effect. Rezaei and Jalili [54] using data from 2001-2009 and taking into account some characteristics of the bank such as size and liquidity showed the existence of credit channel in the Iranian banking system; although this mechanism is weak through interest rates.

Gholibegloo [28] has examined the performance of monetary policy instruments in relation to reserve ratio and evaluating the effects of its balance sheets on the financial and credit situation of the Iran's banking system. Tracking the effects of monetary policy on banks balances (3 percentage points increase in reserve requirement ratio) from the credit channel based on behavioral relationships in different scenarios shows that the major items of the banking system balance sheet decrease in assets and liabilities side and increase in profit and loss account balances. He shows that in the current banking situation, the high ratio of non-current receivables and the cost of financial debts in combination with the high cost of covering non-current receivables and opportunity cost (tax burden) of limited resources in the central bank have resulted in monetary policy, operating costs and non-operating income will decrease more than operating and non-operating income and gross profit account balance will increase. In other words, despite the reduction of resources and consumption, the contractionary policy has improved the main indicators of banks' health. Ayodele [12] examined this relationship in Nigeria. His results showed that the exchange rate and interest rates have a significant effect on bank lending, but the effect of liquidity and money supply has a negative effect on bank lending. Gonzalez [29] examines the impact of different economic structures on the mechanism of transmission of monetary shocks at



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the international level, taking into account its regional effects, and also at the domestic level by examining the consequences of different levels of financing and studying the reaction of domestic financial markets to monetary policy announcements. He showed that banks operating in different countries and having an international presence reduce the impact of monetary policy on the domestic economy by activating the domestic capital market. They also cause monetary policy shocks to spread to other countries where they have branches. He also used the DSGE model dividing firms into two groups: one firm that financed households by selling bonds and the other firms that were affiliated with the bank. The results indicated that the first group showed a stronger response to monetary shocks, but the response of firms with financial constraints to shocks was weak.

This means that the monetary authorities of countries with poor financial development and financially constrained firms will have to impose higher policy rates. Other studies have examined the mechanism of monetary transfer in both conventional and unconventional monetary regimes. Caporel et al. [18] examined the lending channel of the monetary policy transmission in both conventional monetary policy and Islamic policy. They showed that the Islamic banking system is less sensitive to positive and negative interest rate shocks than the conventional banking system. Albertazzi et al. [7] examined the lending channel in both conventional and unconventional monetary policy systems and showed that this channel exists in both systems, although their performance is different.

In the conventional system, this channel is weaker in banks with more capital, and in the unconventional system, it has an increasing trend in banks with better financial position and stronger capital. Picault [50] examined the conventional and unconventional monetary policy of the European Central Bank after the 2008 crisis and its impact on financial markets and the economy specifically dealing with the two channels of lending and the signaling channel. By examining 15 financial institutions, he showed that unconventional monetary policies affect the financing process of financial institutions in the short run that confirms the existence of the lending channel. Rashid et al. [51] examined the difference between the performance of Islamic and conventional banking in Malaysia. They used the three variables including interest rate on deposit, interest rate on bank facilities and the difference between interest rate on deposit and interest rate as monetary policy variables and showed that there is a money transfer mechanism in Malaysia and the conventional banking response to monetary policy is more than Islamic banking response. Their results also showed that smaller banks and banks with less liquidity are more affected by monetary policy than larger banks with more liquidity.

Chakraborty et al. [19] examined the US Federal Reserve's quantitative easing policy, which was in the form of mortgage-backed securities and treasury securities, and showed that the effects of these two policies are different. Some researchers examined this mechanism in the stock market; Mishi [43] examined the stock market channel of the money transfer mechanism in South Africa and showed that the stock market plays an important role in the lending pattern of the country's banks and the traditional hypothesis of the lending channel is not rejected in this country. Liu [39] examined the impact of the lending channel of the money transfer mechanism on Chinese securities and showed that the lending channel affects securities. Some studies have also examined the impact of monetary policy mechanism on other countries: Takáts et al. [70] showed that changes in the monetary policy of United States, the European Union and Japan, loans that are repaid in these currencies in other countries are also affected even if neither party is a party to these countries. Avdjiev et al. [11] examines the impact of US monetary policy on the indebtedness of other countries and shows that this relationship depends on the dominant regime of international capital flows and the two main components of the Federal Reserve rate. Albrizio et al. [8] examined the impact of US domestic monetary policy on the economies of other countries and showed that with the increase in financing costs following an external shock, foreign

borrowing decreases significantly. Other studies have looked at this issue from other aspects; Mathanaseth et al. [41] examined the degree of transfer of monetary policy rates to the banking market and to estimate the own- and cross-price elasticities of banks' loan supply and demand for financing. Bottero et al. [17] showed that in the conditions of expansion and lending boom, banks' risk-taking increases. Serrano [59] examines the impact of delinquent claims on the balance sheets of European banks and the lending channel. Using data from Spain and Peru, Ivashina et al. [33] defined four types of loans: asset-based loans, cash-based loans, commercial financing, and leasing, and showed the performance of banks' lending channels among these four types of loans. They found that the loan supply shocks in the economic literature are caused by individual facilities and the effects of monetary policies and financial crises transmitted through the balance sheets of banks that originate from the loan. They also showed that asset-based loans are not affected by these shocks. Using Indonesian data for 2005-2016, Driantino Naibro [23] showed that there is a lending channel for both large and small banks, and that the central bank can use prudential tools to influence capital and the liquidity of the country's banks to manage the supply of bank loans. Although many studies have been done, there are still dark spots in this area. This article tries to address some of these ambiguities.

### 3 Methodology

In this study, six variables have been used to estimate the monetary policy transmission in Iran. These six variables are: oil prices, reserve ratio, inflation rates, financial repression index, exchange rates and lending facilities of the banking system. In order to collect data, quarterly time series data of the Central Bank of Iran and data of the Statistical Center of Iran were used. Most studies conducted in Iran indicate the strong impact of important macroeconomic variables in Iran on oil revenues. Considering that the increase in oil revenues in most years has led to an increase in money supply, this variable has been used as one of the effective variables [4, 62]. Choosing the criterion of monetary policy is one of the main challenges of most researchers in this field, both domestic and foreign. Taghavi et al. [68] and Gholibegloo [28] considered the legal reserve ratio, Parvin et al. [49] considered legal reserve and interest rate as an indicator of monetary policy, and Mehregan et al. [42] considered interest rates as monetary policy indicator. Renani et al. [63] considered the level of banks' debt to the central bank and the legal reserve ratio as monetary policy indicators. Komijani and Alinejad [36] used net foreign exchange reserves as an indicator of monetary policy.

Khoshnood and Esfandiari used the liquidity variable (as a difference of the liquidity logarithm) as a monetary policy variable. Noferesti [46] showed that the legal reserve ratio can be used as a potential policy variable. Rezaei and Jalili [53] used the interest rate on facilities as a monetary policy tool. Abdullahi Arani et al. Used interest rate and money supply variables as monetary policy. In foreign studies, Lerskullawat, A, [37] Ayodele [12] and Apergis [10] used interest rates as monetary policy. Albertazzi [6] used the major financing rate of the European system for conventional monetary policy and the shadow rate for unconventional monetary policy. Sengonul and Thorbecke [59] used overnight interest rates as a measure of monetary policy. According to studies, the best variable that can be used to describe monetary policy behavior is the interbank market interest rate [44]. The interbank market is a component of the money market in which banks and other credit institutions trade with each other for short-term financing. Efficient interbank markets favorably transfer liquidity from surplus financial institutions to deficit institutions. Therefore, policymakers have a high incentive to create an efficient and strong interbank market so that the central bank can achieve its desired interest rate. Accordingly, the interbank money market plays a key role in implementing monetary policy. This market is the starting

point for the transmission mechanism of monetary policy shocks, and in industrialized countries, overnight deposit rates in this market are the operational goal of the central banks. The Banking Market Operational Law of Iran was approved in 2004 and it started working by accepting the membership of the applicant banks in the form of overnight, one week, one month, two months, quarter, six months, nine months and one year transactions since 2008. Monthly interbank interest rate data have been published since 2015. Due to the unavailability of interbank market data for the period of research, the legal reserve ratio was inevitably used as a monetary policy variable. In order to determine the financial repression index, PCA core component analysis was used. Basic component analysis is one of the classic multivariate methods and perhaps the most famous of them, first introduced by Pearson as a means of flattening pages through orthogonal least squares and later developed by Hotelling in order to analyze the structures of variance-covariance matrix and correlation coefficient. Due to the complexity of the calculations, this method of analysis was not welcomed until the invention of computers. But after that, it was developed extensively in theory and practice. This type of analysis can be considered from different perspectives:

- Converting dependent variables to non-correlated variables
- Finding linear compounds with large or small relative variability
- Reducing data volume
- Interpretation of data

This type of analysis is usually not a final analysis but is used as an intermediate tool for further study and investigation. Mathematical aspects used in this method include eigenvalues and eigenvectors that are always positive symmetric matrices. Data reduction is the main purpose of this analysis, which includes a large number of variables with internal correlation, in a way that preserves the information contained in the data as much as possible. This procedure is done by converting the data (variables) into new variables, which are called basic components and are non-correlated, and are prioritized in such a way that a small number of them often bring changes in the original variables. In this method  $x_1, x_2, \dots, x_p$  are the linear composition analysis of the  $p$  variable (attribute) that is obtained to create independent indices  $y_1, y_2, \dots, y_p$ . These indicators are collectible due to their independence; in other words, they can measure different aspects of the information of the principal variables ( $x$ 's). The usefulness of this method is when there is a high correlation between variables. In this case, a small number of these indicators will bring the general aspects of the information of the main variables.

To determine the index of financial repression in Iran, three indicators of mandatory facilities, volume of participation bonds and legal reserve rate have been used. In order to calculate the inflation rate, the price index of consumer goods and services to the base year 2016 was used because its data were available for the research period. Informal market exchange rate data of the dollar were used to collect data on exchange rates. Legal reserve ratio was used for monetary policy data due to the unavailability of interbank data. In this study, the SVAR method or structural VAR model has been used to investigate the effect of financial repression on the monetary policy transmission. In this method, a simultaneous equation model is first designed in which all variables are a function of each other's current and past values. By solving the SVAR model for the desired variables, a solved VAR form is obtained in which each of the variables is a function of past values and all the variables in the model that is called the standard VAR, which can be estimated by OLS method. One of the main issues in these models is the ability to identify the SVAR model, which means that by estimating the standard VAR, the coefficients of the SVAR model can be obtained. The summary form of the model is written as equation (1):

$$X_t = C + D(L)X_{t-1} + u_t \quad (1)$$

In this equation,  $X_t = (\text{oil. rr. inf. fr. exch. cr})$  includes (oil) the country's oil revenues, (rr) legal

reserve ratio and representative of the central bank monetary policy, (inf) inflation rate, (fr) financial repression index, (exch) exchange rate and (cr) facilities granted by the banking system to the private sector. Of these six variables, one variable is in the external block and the rest are in the internal block. The external block variable includes the price of oil. This variable affects the internal block variables but not affected by them. Internal block variables include the legal reserve ratio, the inflation rate obtained using consumer price index data, and the financial repression index, which includes three variables: legal reserve ratio, mandatory facilities and bonds, exchange rate, and facilities granted by the banking system. C is a vector of constant values and D(L) is a matrix of polynomial coefficients of intervals. The components of the abbreviated form are defined as equation (2):

$$u_t = u_{oil}, u_{rr}, u_{inf}, u_{exch}, u_{fr}, u_{cr} \quad (2)$$

Where  $u_{oil}$  are shocks related to oil revenue,  $u_{fr}$  is shock related to the index of financial repression,  $u_{inf}$  is shock related to the inflation rate,  $u_{exch}$  is shock related to the exchange rate,  $u_{rr}$  is shock related to the monetary policy variable, and  $u_{cr}$  is shock related to the granting facility. The SVAR vector autoregression model will be as follows:

$$\begin{bmatrix} \varepsilon_{oil} \\ \varepsilon_{rr} \\ \varepsilon_{exch} \\ \varepsilon_{inf} \\ \varepsilon_{fr} \\ \varepsilon_{cr} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{bmatrix} \begin{bmatrix} u_{oil} \\ u_{rr} \\ u_{exch} \\ u_{inf} \\ u_{fr} \\ u_{cr} \end{bmatrix} \quad (3)$$

To identify the VAR model, we need to impose constraints on the coefficients of the SVAR model, especially the matrix coefficients. There are various methods for identifying Cholesky, Sims-Bernanke, Blanchard-Quah method, and Pesaran and Shin decomposition, among which Cholesky decomposition method decomposes the least assumptions to identify the model and is more useful than others. In this method, ranking variables is very important and the first variable is generally the cause of other variables. In the first line, it is assumed that oil revenue shocks affect all internal variables but are not affected by them [41, 59].

$$\varepsilon_{oil} = a_{11}u_{oil} \quad (4)$$

Other relationship can be written as equation (5):

$$\begin{aligned} \varepsilon_{rr} &= a_{21}u_{oil} + a_{22}u_{rr} \\ \varepsilon_{exch} &= a_{31}u_{oil} + a_{32}u_{rr} + a_{33}u_{exch} \\ \varepsilon_{inf} &= a_{41}u_{oil} + a_{42}u_{rr} + a_{43}u_{exch} + a_{44}u_{inf} \\ \varepsilon_{fr} &= a_{51}u_{oil} + a_{52}u_{rr} + a_{53}u_{exch} + a_{54}u_{inf} + a_{55}u_{fr} \\ \varepsilon_{cr} &= a_{61}u_{oil} + a_{62}u_{rr} + a_{63}u_{exch} + a_{64}u_{inf} + a_{65}u_{fr} + a_{66}u_{cr} \end{aligned} \quad (5)$$

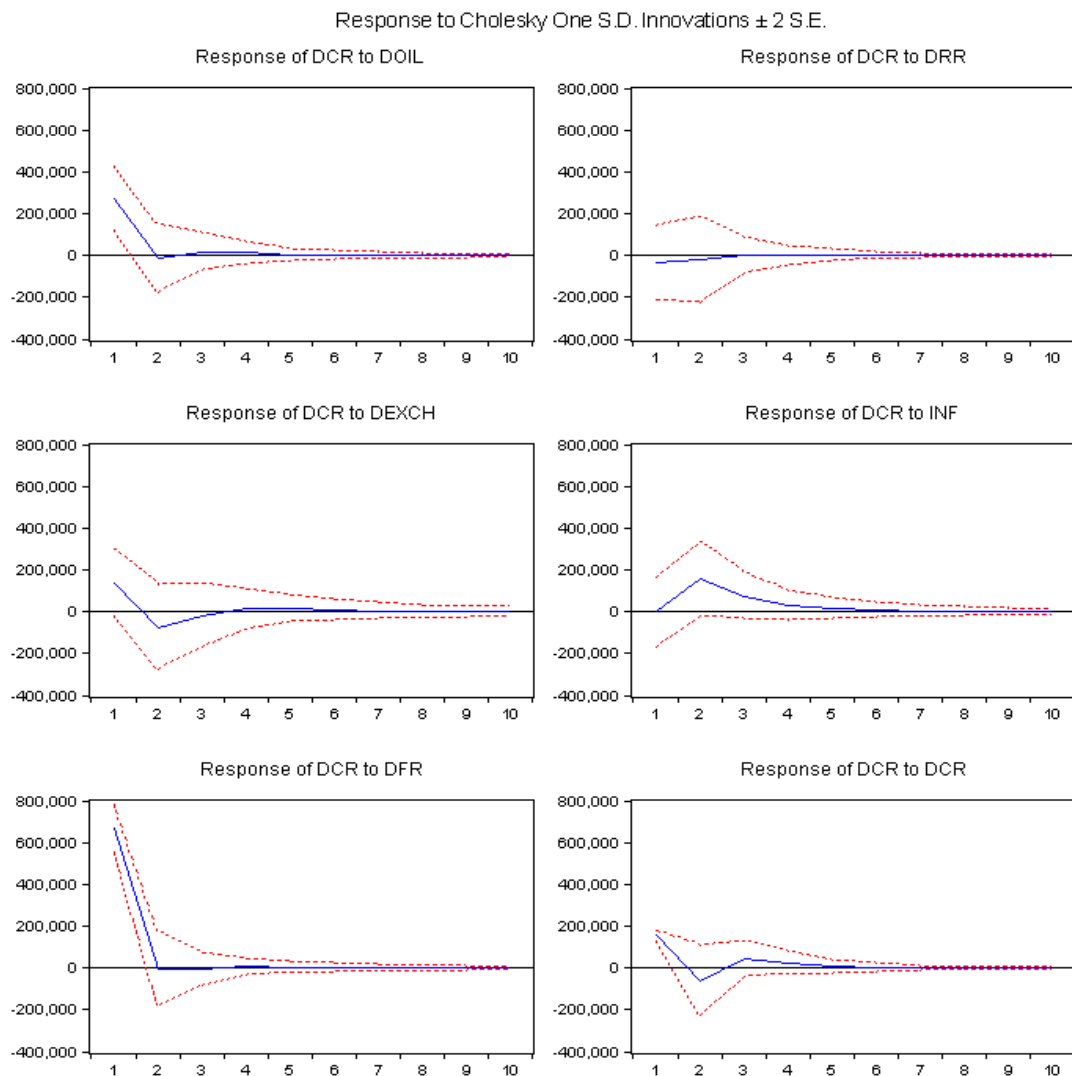
## 4 Results and Discussion

The next important issue is determining the number of lag. Akaike, Schwarz's Bayesian, and Hannan-Quinn Information Criterion, final prediction error and probability index are commonly used to determine the number of lags. Table 1 presents the test results.

**Table 1:** Lag Determination Result

HQIC	SBIC	AIC	FPE final prediction error	Likelihood ratio	Log L	Number of lags
119.9	120.2	119.8	2.67	NA	-1071.7	0
114.4*	116.7*	114*	1.25*	112.7*	-970.2	1

As can be seen, based on all the indicators, the best lag order is one. In the following, the effect of shocks is investigated using cumulative instantaneous reaction functions and analysis of variance. In the first chart of F, which examines oil price shocks on banks' lending, this effect is positive for up to two periods, but it is not statistically significant. The second diagram examines the monetary policy index on the amount of facilities granted by the banking system, which shows the ineffectiveness and meaninglessness of this index due to the determination of the legal reserve ratio regardless of economic realities and banking variables. An examination of the trend of the legal reserve ratio shows that this variable has not changed proportionally despite the sharp fluctuations in the country's economic conditions, so it is natural that the impact of the shocks on the granting facilities is meaningless.



**Fig. 5:** Impulse response function

In the chart related to the financial repression index, it can be seen that the impact of this shock is positive and significant for both periods. After two periods, this effect disappears. Iran's economy has been suffering from financial repression policies for many years including controlling interest rates on deposits and loans, regulating exchange rates, and government credit management policies. The government supported some sectors of the economy and provided them with facilities at negative real interest rates. Implementing financial repression policies is done through mandatory facilities, orderly determination of facility interest rates, freezing bank's resources by forcing them to sell participation bonds, etc. In the inflation rate response diagram, the effect of this variable is positive up to five periods but not significant. The impact of the exchange rate for the first period is positive but not significant. In the last diagram, the reaction of the granted facility to its own lag is significant only for one period and then becomes meaningless. The following is a Table 2 of variance analysis.

**Table 2:** Variance Analysis

DCR	DFR	INF	DEXCH	DRR	DOIL	S.E.	pe- riod
4.200389 (0.93949)	78.94394 (8.09993)	0.000538 (1.84561)	3.397968 (3.72340)	0.194835 (1.49706)	13.26233 (7.53752)	3.65E+08	1
4.549714 (3.24927)	74.41016 (8.84821)	4.111278 (4.43773)	4.148694 (4.24995)	0.252576 (2.28543)	12.52758 (6.69675)	4.70E+08	2
4.806212 (3.25301)	73.42378 (9.08276)	4.954620 (4.77838)	4.151771 (4.27498)	0.249537 (2.23825)	12.41408 (6.61503)	5.04E+08	3
4.896389 (3.34791)	73.20820 (9.26370)	5.077335 (4.89206)	4.163968 (4.27585)	0.248843 (2.22083)	12.40526 (6.57789)	5.09E+08	4
4.900277 (3.35387)	73.15197 (9.35677)	5.104694 (4.92577)	4.197657 (4.31727)	0.249045 (2.21783)	12.39636 (6.57396)	5.10E+08	5
4.899385 (3.35389)	73.13534 (9.40826)	5.112852 (4.93735)	4.209259 (4.34769)	0.249469 (2.21912)	12.39370 (6.56795)	5.10E+08	6
4.899154 (3.35411)	73.13151 (9.43486)	5.115127 (4.93807)	4.211315 (4.36570)	0.249655 (2.21816)	12.39324 (6.56593)	5.10E+08	7
4.899126 (3.35363)	73.13079 (9.44779)	5.115650 (4.93728)	4.211583 (4.37634)	0.249697 (2.21818)	12.39315 (6.56447)	5.10E+08	8
4.899128 (3.35301)	73.13066 (9.45463)	5.115754 (4.93708)	4.211621 (4.38191)	0.249704 (2.21812)	12.39313 (6.56345)	5.10E+08	9
4.899130 (3.35255)	73.13063 (9.45863)	5.115774 (4.93743)	4.211629 (4.38497)	0.249705 (2.21809)	12.39313 (6.56280)	5.10E+08	10
Cholesky Ordering: DOIL DRR DEXCH INF DFR DCR							
Standard Errors: Monte Carlo (100 repetitions)							

Structural analysis of variance is used to determine the importance of each variable. In this method, the variance of the prediction error is decomposed into elements that contain the impulses of each variable and it can be checked what percentage of the variance of the prediction error is explained by the variable itself and what percentage by the other variables. The column (S.E) indicates the forecast error in different periods, the source of which is the change in current values and future shocks. Subsequent columns show the percentage of variance due to sudden changes or specific shocks. According to the information in Table 2 in the first period, 78.9% of the variance of banks' payment facilities is explained by the financial suppression variable and only 4.2% of the changes are explained by the variable itself, 13% by oil shocks and 3% by the exchange rate. After ten periods, 73% of facility changes are explained by financial repression, 4.8% by self-variable shocks, 12% by oil shocks, 4% by exchange rates and 5% by inflation. Therefore, the index of financial repression is the most important variable in the short and

long term to explain the changes in bank facilities. Also, in the long run, the impact of oil shocks is reduced and the importance of exchange rate shocks is increased.

## 5 Conclusions

Understanding the working of monetary policy transmission mechanism is crucial for policy makers because it helps them to determine how their decision impact the economy. Banks, as the most important financial institutions that are in charge of the process of monetary policy transmission mechanism, are affected by the interaction of fiscal and monetary policies on the one hand, and on the other hand, following the ban on government borrowing from the central bank in the Third Development Plan, Credit lines and overdrafts from central bank resources to execute government orders follow the same traditional method of financing the government from central bank resources with slight differences. On the other hand, in Iran, the interest rate of banking facilities is not obtained from the balance of supply and demand of loans, but is determined by the Monetary and Credit Council for different economic sectors [31]. The study conducted by Haeri Nasab et al. [30, 31] shows that the relationship between the interest rate of bank facilities and the inflation rate is negative.

Determining interest rates is an example of financial repression. Governments intervene in the capital market in a number of ways: by orderly setting interest rates on bank deposits, high rates of legal reserves, enforcing mandatory facilities, issuing bonds, and forcing banks to buy bonds. A study of Iran's economy shows that in recent decades it has faced severe financial repression. Because deposits are the main source of bank financing, it is necessary to examine the factors that affect the lending resources of banks. One of these factors is the policy of financial repression of governments. In this study, we examined the impact of financial repression on the lending channel of the country's banks. First, in order to define the financial repression index using PCA method, an index was defined which includes three variables: volume of granted facilities, legal reserve ratio and volume of participation bonds issued by the government, and then using SVAR method and instant response functions was employed to examine the impact. Variables were discussed on the supply of bank loans.

The results show that the impact of financial repression on the supply of bank loans is positive and has significantly increased the supply of bank loans. Obligatory facilities are one of the examples of financial repression, since obligatory facilities are usually paid at a rate lower than bank interest and a significant part of it turns into overdue debts and past matured, that has a negative impact on bank's balance sheets and reduces bank's lending power. Another example of financial repression is the imposition of negative interest rates on the banking system under the pretext of supporting production, which in practice has unpleasant consequences. The results of the research can be examined from two aspects with other studies: in terms of examining the impact of financial repression on the lending channel, and in terms of examining the impact of monetary policy on bank lending. In terms of the impact of financial repression on the lending channel, in domestic studies despite the importance of the phenomenon of financial repression and its consequences on the financial system and subsequently on macroeconomic variables, no study has examined the impact of financial repression on the banks' lending channel, but in foreign studies, Eggertsson et al. examined the impact of negative interest rates, which is one of the indicators of financial repression. The results showed that despite the negative policy rate, the traditional lending channel no longer operates and with the reduction of the policy interest rate, the supply of loans increases. The results of the present study are in line with Eggertsson's study in this regard.

In terms of examining the effect of monetary policy rate on the lending channel, the results of this study are consistent with the study of Shirin Bakhsh et al. [64] and Rezaei et al. [54], Sanfilippo-Azofra et al. [57], Simmons [65], Abuka [3]. The law as a monetary policy variable has no effect on bank's

lending channels. In recent years, the central bank has taken several steps to improve the conditions of banks including a plan to merge five banks and institutions into one state-owned bank, changing financial reporting standards, increasing oversight of institutions and banks, enforcing money laundering regulations, and open market operations law. One of the recent measures taken by the central bank to compensate for the government budget deficit is the issuance of government bonds, which is hoped to allow interest rates to be set through the market mechanism instead of the mandatory rate. But the problem that the banking system still faces is the orderly determination of the legal reserve ratio, interest rates on deposits and facilities, mandatory facilities, accumulation of banks' claims on the government, etc. It is expected that with the improvement of central bank independence in recent years, we will see economic and expert decisions in determining the price of banking products.

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