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Modeling the Interactions Between Interest Rate Suppression Risk and Financial Inclusion on Bank Financial Robustness using Simultaneous Equations

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ABSTRACT

Research shows that interest rate suppression in the economy has adverse effects on bank performance. These conditions lead to increased risk, reduced banks' ability to provide loans, reduced core banking activities, and decreased operating profit margins. In contrast, financial inclusion has been considered as an important policy for increasing access to financial services in recent years. By expanding the scope of bank customers, especially among people who were previously deprived of banking services, this policy can increase deposits and create more diverse and stable financial resources for banks. Given the functional conflict between interest rate suppression and financial inclusion, it is necessary to evaluate the simultaneous effects of these two factors on the banking system. In this study, information on 15 banks and financial institutions active in the Tehran Stock Exchange over a 9-year period (2014 to 2022) was examined. Data were collected through a library method and document mining. To test the research hypothesis, after constructing indicators related to financial inclusion, multiple regression and simultaneous equations method using mixed data were used. The results show that in the conditions of interest rate suppression, the financial behavior of banks is highly dependent on financial inclusion. Financial inclusion in this situation has improved indicators such as equity ratio, capital adequacy, and loan-to-deposit ratio and has had a significant positive impact on the stability and stability of banks and the financial soundness of the bank in general.

Keywords: interest rate suppression, financial inclusion, banking industry, financial soundness

1- INTRODUCTION

The literature on financial inclusion has been raised in academic and policy circles since the 1970s. In general, the central idea of financial inclusion was developed on the basis that all people should have the opportunity to benefit from financial services. The concept of financial inclusion has developed over time; so that it first began with more limited titles such as microcredit and microfinance and then evolved into the term financial inclusion. Muhammad Yunus, winner of the Nobel Peace Prize in 2006, is known as one of the first pioneers in this field. The $27 microloans he provided to poor people in Bangladesh made a huge difference in their livelihoods and in the country's economy as a whole. To show the status of countries in the world in terms of financial inclusion, several indicators have been proposed with qualitative-quantitative, simple-composite, and supply-demand approaches. Most countries in the world consider improving their ranking in financial inclusion indicators to make policies to eliminate poverty and inequality (Ahmed and Malik, 2019). The relevance of financial inclusion as a policy to improve the spread of financial services has gained considerable value in recent years. Experts believe that financial inclusion brings several benefits. In addition to increasing economic growth, financial inclusion helps reduce poverty and income inequality and can lead to improved investment and raise issues for interest rates as a tool for macroeconomic stability. Focusing on banks, it has been argued that account ownership improves the base of retail depositors and provides them with a cost-effective and flexible source of finance. In turn, this helps reduce financial costs and risk and improves stability (Ghosh, 2022).

In this regard, using cross-country data, Ahmed and Malik (2019) confirm that financial inclusion improves bank stability. However, criticisms raised against this argument are that financial inclusion can push banks towards riskier

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borrowers, increase transaction costs and exacerbate information asymmetries. This can also increase banks' propensity to default. As a result, it can increase funding costs, disrupt lending and reduce profitability. As a result, the impact of financial inclusion on bank stability can go both ways (Perrin and Weil, 2022).

Given the mixed and ambiguous effects of financial inclusion, the phenomenon of financial inclusion is very different; although account ownership is on average 67% globally, it is negatively skewed with a mean of 72%. The values at the 10th and 90th percentiles are 28 and 97%, respectively. On the other hand, despite the growing trend towards financial liberalization, interest rate suppression is still quite widespread. A recent study by Kalik et al. (2020) shows that 63 out of 108 (or almost 60%) of the countries surveyed have interest rate controls. This includes not only 37 low- and middle-income countries, but also 26 high-income countries. In addition to weakening credit assessment capabilities, interest rate controls prevent banks from passing on intermediation costs to borrowers. As a result, to maintain margins, banks expand lending to riskier borrowers (adverse selection) or borrowers who have not yet been tested, possibly at higher rates. Beck et al. (2015) show that higher lending rates stimulate non-performing loans in banks (Kalik et al., 2020).

Therefore, as is clear from the general definitions of the two concepts of interest rate suppression and financial inclusion, these two financial-economic states perform functions that are opposite to each other, especially in financial systems; as financial inclusion is expected to increase and improve financial operations, but interest rate suppression usually leads to limiting and suppressing the provision of financial services. Therefore, it is clear that the effectiveness of the interaction between financial inclusion and interest rate suppression and its manifestation on financial strength is a questionable issue. In order to clarify this relationship, the present study has modeled the interaction between the risk of interest rate suppression and financial inclusion on the financial strength of the bank using simultaneous equations.

2- RESEARCH LITERATURE

2-1-Interest Rate Suppression

Financial repression is defined as a set of policies, laws, and formal regulations and informal controls imposed by governments on the financial sector. It can also be said that financial repression is a set of internal and external regulations that; Domestic regulations include setting a ceiling on borrowing, domestic interest rate laws, financial investment restrictions, and foreign regulations such as exclusions and tax discrimination for those holding foreign assets (Deniz and Georgiev, 1998). Interest rate suppression occurs when the government lowers the interest rate to a level lower than the real rate of return on capital that investors are willing to accept. The rate that results from the return on the real sector of the economy is, in fact, the return on productive activities. Therefore, if the policymaker sets the interest rate lower than the rate of return in the productive sector of the economy, he has actually implemented a policy of financial repression. Given that the real return on capital cannot be measured directly, the inflation rate is used as the minimum rate of return on capital in the real sector of the economy, below which investors are not willing to invest. Accordingly, in years when the interest rate in the country (the one-year interest rate of state-owned banks) is lower than the inflation rate, interest rate suppression has occurred and the INDEX variable will have a value of one, and otherwise it will have a value of zero (Abbasi, Ebrahimzadeh, Forouhar, 2011).

2-2-Financial inclusion:

Financial inclusion means that all people should have the opportunity to benefit from financial services. The concept of financial inclusion has developed over time; so that it first began with more limited titles such as microcredit and microfinance, and then evolved into the term financial inclusion. Financial inclusion is considered a type of access to financial services, which should be categorized in various dimensions, namely in three dimensions, availability, penetration, and level of use of financial services (Perrin and Weil, 2022). In various studies, different variables have been used to measure financial inclusion. In this study, following Ghosh (2022), Liu et al. (2021), Kim et al. (2018), and Balonejad Nouri and Farhang (1400), in the penetration dimension, the number of bank accounts, in the accessibility dimension, the number of ATMs and the number of bank branches, and also in the usage dimension, the growth rate of deposits in the banking sector will be used and used in calculating the financial inclusion index. A review of scientific sources shows that several definitions have been provided by international institutions for financial inclusion. The Advisory Group on Supporting the Poor (2011), which is a global partnership consisting of

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30 leading development organizations, considers financial inclusion to be a situation in which the active population of a country has effective access to financial services provided by formal financial institutions. From the perspective of the International Monetary Fund (2015), financial inclusion means access to formal financial services and their use by households and firms. Also, according to the World Bank (2018) definition, financial inclusion is the access and use of affordable and quality financial products and services by individuals and enterprises, including payments, bank accounts, credit and insurance, that are provided in a responsible and sustainable manner and meet their needs. In the theoretical framework, promoting financial inclusion has positive effects on the economy at the micro and macro levels. At the micro level, access to and use of financial services leads to improved living standards for low-income households and increased opportunities for growth and development of small and medium-sized enterprises. Through access to credit and increased savings, households can smooth their consumption levels over time (despite income fluctuations) (Owen and Pereira, 2018). Also, poor households, including rural and agricultural households, can reduce their future risks by purchasing various insurance products, including agricultural and livestock insurance, as part of the microfinance supply chain (Barman et al., 2009). Access to bank credit by SMEs also leads to increased investment, employment and growth of these firms (Ahiavedi and Adad, 2012). At the macro level, the development of financial inclusion leads to increased economic growth (Dabella-Norris et al., 2015; Kim et al., 2018; IMF 2021), reduced poverty and inequality (Inoue and Hamuri, 2016), and improved financial and economic stability (Han and Maleki, 2013; Mehrota and Yeatman, 2015).

2.3- Financial soundness

Financial soundness means the smooth functioning of financial institutions with the necessary profitability and sufficient liquidity to overcome the challenge of bankruptcy (Saidan and Abdullah, 2021). Also, Mishkin (1992) states that financial stability is defined as the ability of the financial system to ensure the efficient distribution of financial resources permanently and without disruption. Therefore, the stability of the financial system is very crucial; especially because money flows among individuals and motivates them to consume and invest, which in turn affects real economic growth. In the context of empirical studies, the results of examining the relationship between efficiency and stability have yielded contradictory results. In such a way that some studies concluded evidence of a two-way negative relationship between risk and efficiency in banks. Inefficient banks have more risk and, on the contrary, are less efficient (Permatasari and Nangtias, 2020). In contrast, some studies provide different evidence about the efficiency-stability relationship. For example, Brisimis et al. (2018) identified a trade-off between liquidity risk and bank efficiency, where credit risk negatively affected efficiency. In other words, more stable banks may have lower profit efficiency; while higher liquidity risk may result in lower cost efficiency (Chan and Milne, 2014).

Interest rate suppression and bank equity ratio

Interest rate suppression significantly affects bank equity ratio, which is obtained by dividing equity by total assets. This effect significantly stimulates bank profitability and lending behavior. Since a significant weight of a bank's assets is the facilities it grants to its customers and a significant weight of its liabilities is influenced by its deposits; in conditions of interest rate suppression, bank profitability is significantly affected by reducing the level of facilities granted by the bank and reducing deposits by customers (Gross, Blot, Hubert, 2016). The mechanism of action of interest rate suppression on banks' equity ratio is as follows:

Suppressed interest rates: Suppressed or negative interest rates can reduce banks' net profit margins by affecting the difference between the interest received by banks on loans granted and the interest paid on customer deposits. When policy interest rates are low, banks are often unable to reduce deposit rates to an equilibrium level due to avoidance behavior by depositors, which leads to a decrease in bank profitability; which affects the value of banks and their ability to lend (Sapienza, 2002).

Lending behavior: The relationship between interest rates and banks' lending posture is complex. While lower interest rates can stimulate demand for loans, they can also lead to a decrease in banks' profitability, especially if they cannot adjust their deposit rates accordingly. This situation can ultimately affect the ownership structure of banks and their ownership ratios, as a decrease in profitability may lead to consolidation or changes in ownership ratios in the bank (Oyate, Lofton, 2021).

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Financial stability: Prolonged periods of interest rate suppression can lead to financial imbalances, such as increased debt among households and companies. In such circumstances, the profitability and ownership structure of banks will be affected by their increased credit risk (ESRB, 2016).

Interest rate suppression and the capital adequacy status of banks

Continuing the discussion of the effect of interest rate suppression on the financial statements of banks, based on studies conducted so far, interest rate suppression affects the capital adequacy status of banks by affecting their lending capacity and underlying risk. In this regard, the explanation of the factors of this effect is given below:

Cost of capital: Low or suppressed interest rates against inflation reduce the cost of borrowing from banks, which can lead to an increase in the demand for loans and, consequently, an increase in bank lending. However, due to the significant reduction in the difference between the interest received on loans and the interest paid on deposits, bank profitability is severely contracted. This reduction in bank profitability affects their capital base level, so that banks may adopt less internal capital to meet regulatory capital adequacy requirements (Sechti, Kohler, 2014).

Risk-taking behavior: When interest rates are suppressed, banks may adopt riskier service delivery methods to maintain profit margins, potentially leading to a deterioration in asset quality; This ultimately leads to higher risk on banks' balance sheets and threatens bank capital adequacy (Tanaka, 2002).

Monetary policy implementation: Mandatory changes in interest rates are the primary instrument of monetary policy and can affect bank capital through the "bank capital channel". For example, contractionary monetary policy can reduce bank capital by reducing their profitability and thus their ability to lend in the future. As a result, capital adequacy requirements in interaction with monetary policy will affect the overall effectiveness of monetary transmission mechanisms and overall banking operations in providing services (Zheng, Zhai, 2015).

Regulatory implications: Regulatory frameworks such as Basel III establish minimum capital requirements that banks must adhere to. Given that interest rate suppression leads to a decline in bank profitability and capital levels, banks may struggle to meet these requirements, potentially leading to regulatory fines or capacity reductions Their lending will be in the long term (Bindesil, Manzanares, Velor, 2004).

5-2-6 Interest rate suppression and the status of paid facilities and received deposits of banks

As it has been discussed in this study from various aspects, in the first stage of applying the conditions of interest rate suppression, by disrupting the balance between granting facilities and receiving deposits, we will witness a significant decrease in the profitability of banks, which will significantly affect all aspects of a bank's performance. The following are other effects of adopting an interest rate suppression policy on banking operations:

Weakening the role of financial intermediation: When interest rates are suppressed, banks sacrifice their financial intermediation role to maintain banking stability, so that depositors withdraw their funds from the bank due to the attractiveness in parallel markets in return for the insignificant bank return. Under the influence of this behavior, bank depositors will be inclined towards lending less and the bank's operational capacity will become ineffective. Ultimately, the bank will be forced to adopt its strategies regarding deposit acceptance and lending cautiously and reduce its role as a financial intermediary (Zhang, 2011).

Household Impact: In economies with suppressed interest rates, households often receive lower returns on their savings. Financial repression means that households face a "hidden tax" due to reduced income from their deposits, which ultimately leads to their reluctance to deposit money in banks, putting pressure on banks' deposit base, affecting bank loan disbursements, and disrupting bank liquidity management (Bindesil, Sener, 2023).

Competition for deposits: Low interest rates can intensify competition among banks to attract depositors. Banks try to attract more customers by offering minimal returns. This competition may lead banks to innovate in the provision of payment facilities and services to retain and attract depositors, or increase the bank's operational risk (Luke, Poloser, Younger, 2023).

Regulatory considerations: Since policymakers usually seek to ensure financial stability; The macro-regulatory environment in the banking industry may also change in response to suppressed interest rates. This could include a

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review of how deposits are treated in liquidity regulations, especially in the context of banks relying on non-traditional funding sources due to the contraction in their customers' deposit flows (Luke, Poloser, Younger, 2023).

2-4 Research Background

Karimi (1401) has studied "Investigating the Effect of Financial Inclusion on Government Tax Revenues Using ARDL Statistical Method". The results of this study showed that financial inclusion had a positive effect on government tax revenues. Financial inclusion also had a positive effect on tax revenues from corporate income tax and tax revenues from personal income tax.

Esmailian and Sefidbakht (1401) have studied "Investigating the Relationship between Bank Market Structure, Financial Inclusion, and Financial Stability". The results of the study show that the bank's a-score has no relationship with borrowing from a financial institution, but it has a direct and significant relationship with concentration and savings in a financial institution. Bank profitability has a direct and significant relationship with savings in a financial institution, and bank cash assets to deposits and short-term financing have an inverse and significant relationship with borrowing from a financial institution and concentration, and a direct and significant relationship with savings in a financial institution.

Balonjadnuri and Shajaripour (1401) have studied the "effect of competition in banking on financial inclusion" in a study. The findings showed that increasing monopoly (decreasing competition) in the banking industry has reduced financial inclusion in the countries studied. Also, per capita production growth also had a positive and significant effect on financial inclusion. Finally, financial development had a positive and significant effect on financial inclusion when considering the ratio of credits to GDP as a control variable in the model.

Balonejad Nouri and Farhang (1400) have studied the "Effect of Financial Inclusion on Financial Efficiency and Sustainability: An Application of the Multidimensional Indexing Approach" in a study. Based on the empirical evidence of the research, financial sustainability and financial inclusion can be achieved in the form of a common goal. In other words, while maintaining the stability of the financial system, policymakers can achieve goals in which a larger number of people benefit from financial services. In contrast, the findings showed that measures and programs that develop financial inclusion can have side effects in the form of a decrease in financial efficiency. This is due to increased participation in financial markets, which ultimately leads to increased social costs in the systems of each country, which requires the development of complementary programs.

Ghosh (2022) has studied financial inclusion and banking stability: Is interest rate suppression important? Using bank-level data, it is observed that financial inclusion, despite interest rate suppression, has a positive and significant effect on banking stability. The findings support the fact that financial inclusion is beneficial for banking stability, even after accounting for interest rate controls.

Marcellin, Sun, et al. (2022) examine the relationship between financial inclusion and bank risk-taking in 84 countries between 1996 and 2020. According to the results of this study, financial inclusion reduces the risk levels of banks. Mobilizing deposits based on financial inclusion reduces the probability of bank failure and also attracts cheap funding for banks.

Tuna and Al-Mahadin (2021) study whether interest rates and their fluctuations affect banking sector development in emerging countries. A set of banking sector development measures The empirical results show that while interest rates have a positive effect on all banking sector indicators, this relationship weakens at higher interest rates, indicating a concave relationship between interest rates and banking sector development.

Li et al. (2019) conducted a study to examine financial inclusion and its effects on financial efficiency and stability in the Asian region. The findings are robust to different normalization techniques. In addition, the impact of financial inclusion on financial efficiency and stability is analyzed using Feasible Generalized Least Squares (FGLS). The estimation results show that increasing financial inclusion has a negative impact on financial efficiency while having a positive impact on financial stability.

Hamdoi (2017) conducted a study to examine financial liberalization and banking sector crises based on meta-analysis. The research findings show that sample size plays an important role in explaining the divergence in previous results and the use of multidimensional measures in developing countries significantly reduces the link between

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financial liberalization and banking crises. In addition, it is observed that on Some estimation techniques produce results that are systematically different from those obtained by other methods. For example, using the logit approach results in significantly different estimates of the relationship.

3- RESEARCH METHOD

The present study is an applied research in terms of its objectives and a post-event research in terms of its implementation process. The statistical population of the present study is all banks and financial institutions. Given that not all banks and financial institutions are accepted by the Tehran Stock Exchange (which are mainly state-owned banks), therefore, due to the unavailability of the financial statements of these banks, a systematic sampling method was used and only banks that were accepted by the Tehran Stock Exchange and whose financial statement information was available were considered. After considering all the above criteria, 15 banks and financial institutions remained as the screened population, all of which were selected as the research sample. Therefore, considering the 9-year research period (1401-1393), the observations reach 135 company-years (9 years × 15 banks). The data required for the research is collected from library resources, announcements published by the Stock Exchange Organization, the comprehensive database of companies on the official website of the Stock Exchange Organization, Tadbir Pardaz software, etc. First, literature and theories related to the research topic are compiled through library resources, publications, articles and various scientific sources (scientific sites). Then, the main stage of the research begins by extracting information from the financial statements of companies listed on the Tehran Stock Exchange. The extracted information is summarized and classified through Excel, and finally, the mathematical relationship between the independent and dependent variables is determined through eviews software and using the simultaneous equations method.

Table 1- Summary of research variables

Source	Formula	Symbol	Variable	Variable type
Mashaykh, Moghaddisi, 2014	Equity / Total Assets	PR	Equity Ratio	Dependent variable
Bahrami-Zanooz, Mehrabian, Seifipour, Amin-Rashti, 2015	Capital Base / Risk-Weighted Assets	CAR	Capital Adequacy	
Barletrop, Christopher, J., 2007	Total Loans / Total Deposits	LTD	Ratio of total loans to total deposits	
Abbasi, Ebrahimzadeh, Forouhar, 2011	Years when the interest rate is less than the inflation rate, INDEX will have a value of one, otherwise it will have a value of zero.	INDEX	Interest rate suppression	Independent variable
Ghosh (2022), Liu et al. (2021), Kim et al. (2018) and Balonejad Nouri and (2015) Farhang	Deposit Growth Rate in the Banking Sector	OWN	Financial Inclusion Index	Modifier variable
	Number of Bank Accounts			
	Number of ATMs			
	Number of Bank Branches			
Zolanourian, 2010	Logarithm of Bank Assets	Size	Bank Size	Control variable

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Zolanourian, 2010	Deposits / Assets	DTA	Deposit to Assets Ratio	
Aminian, 2014	Cost / Income	CTR	Cost to Income Ratio	

In order to analyze the information considering several sections (i) and several years (t), the type of data arrangement is combined or pooled (Panel Data). Also, to estimate the research patterns simultaneously, the regression model of seemingly unrelated equations (SUR) is used. The main essence of the multiple regression model is that it describes the behavior of the specific variable under study based on a set of explanatory variables. When the goal is to explain the entire system, then there will be more than one multiple regression equation. For example, in a set of multivariate linear regression equations, each equation may explain some economic phenomenon. However, such a system can be estimated either as separate equations or using ordinary least squares (OLS). Although these estimates seem consistent, they are not as efficient as SUR, which uses generalized least squares with a special form of the variance-covariance matrix. SUR is equivalent to OLS in two cases: 1) The error components between the equations are uncorrelated 2) Each equation contains the same set of regressors on the right-hand side of the equation. In addition, the SUR model can be generalized to the simultaneous equations model, such that the regressors on the right-hand side of the equation can be endogenous. In estimating equations in this way, intermediary variables are variables that are placed between the dependent and independent variables and affect the effect of the independent variable on the dependent variable. In general, it can be said that researchers with this method seek to determine the indirect effect of the independent variable on the dependent variable through the intermediary variable (Preacher, Hayes, 2008). Excel software was used to arrange the data. It should be noted that all analyses will be carried out with the help of Eviews software version 12.

4- FINDINGS

In order to present a model of interest rate suppression in bank behavior with a focus on financial inclusion, the following simultaneous equation system estimation is used:

Equation 1-4: Simultaneous equation system model

$$PR_{it} = c_0 + c_1\, INDEX_{it} + c_2\, OWN_{it} + c_3\, INDEX{*}OWN_{it} + c_4\, Size_{it} + c_5\, DTA_{it} + c_6\, CTR_{it} + e_{it}$$

$$CAR_{it} = c_7 + c_8\, INDEX_{it} + c_9\, OWN_{it} + c_{10}\, INDEX{*}OWN_{it} + c_{11}\, Size_{it} + c_{12}\, DTA_{it} + c_{13}\, CTR_{it} + e_{it}$$

$$LTD_{it} = c_{14} + c_{15}\, INDEX_{it} + c_{16}\, OWN_{it} + c_{17}\, INDEX{*}OWN_{it} + c_{18}\, Size_{it} + c_{19}\, DTA_{it} + c_{20}\, CTR_{it} + e_{it}$$

The estimation method in this study is the simultaneous equation system method in panel data. In panel data econometrics, it is assumed that the data used are cross-sectionally independent. This assumption, like other assumptions, may not hold, so the first step in panel data econometrics before performing any test is to detect cross-sectional dependence or independence. In this study, the Boys' Cross-Sectional Dependence Test (2021) was used and its results are shown in Table 2.

Table 2- Results of the Boys' Cross-Sectional Dependence Test for the Equation System Variables

Significance (Prob)	The value of the boys' test statistic	Symbol	Variables
0.000	13.63	CAR	Capital adequacy
0.000	21.63	SIZE	Bank size
0.000	9.25	PR	Equity ratio
0.000	14.25	LTD	Loan-to-deposit ratio
0.000	17.12	DTA	Deposit-to-asset ratio
0.000	3.66	CTR	Cost-to-income ratio
0.000	13.09	INDEX	Interest rate suppression
0.000	12.02	OWN	Financial inclusion

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In this test, the null hypothesis indicates the absence of cross-sectional dependence in the variables under test. As the results of Table 2 show, the probability value of the Boy's test statistic for the variables is less than 0.05, so the null hypothesis of the Boy's test is rejected and cross-sectional dependence exists in the mentioned variables.

Whenever cross-sectional dependence is confirmed in panel data, the use of conventional panel unit root methods such as Levine and Lin (LL), Im, Boy's and Shin (IPS) tests, etc. will increase the probability of false unit root results. To solve this problem, there are several tests such as the Boy's unit root test (2007) and the Hadri and Rao unit root test (2008) to examine stationarity. The advantage of the Hadri and Rao (2008) stationarity test over the Hadri and Rao unit root test is that it considers structural failure and cross-sectional dependence simultaneously. Therefore, in this study, the unit root test of Hadri and Rao (2008) has been used. The null hypothesis in this test is stationary for the variables under test. If the critical values at the 99th, 97.5th, 95th and 90th percentile levels are greater than the stationary statistics, then the null hypothesis is not rejected, and as a result, the variable in question is stationary.

Table 3- Results of the unit root test of Hadri and Rao (2008) for the variables of the system of equations

the result	Mana'i statistics	P-Value	Critical values at different confidence levels				Variable
	HR			% 95	% 97/5	% 99	
manna	0.294	1.000	manna	5.924	6.347	7.634	CAR
manna	0.359	1.000	manna	13.937	16.567	20.297	SIZE
manna	□□□□□	1.000	manna	□□□□□	□□□□□	□□□□□□	PR
manna	□□□□□	1.000	manna	□□□□□	□□□□□□	□□□□□	LTD
manna	□□□□□	1.000	manna	□□□□□	□□□□□□	□□□□□□	DTA
manna	□□□□□	1.000	manna	□□□□□	□□□□□□	□□□□□□	CTR
manna	□□□□□	1.000	manna	□□□□□	□□□□□□	□□□□□□	INDEX
manna	□□□□□	1.000	manna	□□□□□	□□□□□□	□□□□□□	OWN

According to the results of Table 3, the critical values of all the variables in question are greater than the stationary statistics, so the null hypothesis is not rejected and all the variables are stationary. In the simultaneous equation system, the detectability of the equation must be determined before estimating the model. The degree and rank conditions are used for the detectability of the equation. According to the degree and rank conditions in the detectability of the equation in the simultaneous equation system given in Table 4, the equations used in the equation system are overspecified. Therefore, it can be estimated.

Table 4-Discernibility for variables in the simultaneous equation system

Diagnostic ability	Number of predefined variables left out of the equation (K-k)	The number of endogenous variables in the equation minus one (-M1)	
Too specific	5	24	Degree condition
Rank of the coefficient matrix of variables (endogenous and predetermined) outside the equation			
Exactly or more than specified	Exactly or more than specified		Rank condition
More than specified	Grade and rank condition		

The next step in estimating the system of equations is to use two-stage least squares in panel data. The model estimation results are given in Table (5). To determine the type of model estimation (panel data or pooling), the F-limer and Hausman tests were used. The value of the F-limer statistic is confirmed based on that panel data against

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pooling. Also, the Hausman test was used to determine the type of model estimation (random effects or fixed effects). The fixed effects estimation method is selected according to the value of the Hausman test statistic.

Table -5 Results of the estimation of the system of simultaneous equations

	□		Variables
□□□□□□	□□□□□□□□	□□□□□□□□	C(0)
□□□□□□	□□□□□□□□□	□□□□□□□□□	C(1)
□□□□□□	□□□□□□□□	□□□□□□□□	C(2)
□□□□□□	□□□□□□□□	□□□□□□□□	C(3)
□□□□□□	□□□□□□□□	□□□□□□□□	C(4)
□□□□□□	□□□□□□□□	□□□□□□□□	C(5)
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0.0000	-	8.11	F Lemer
0.0120	-	35.13	Haussmann test

Source: Research findings

PR = C(0) + C(1)*INDEX + C(2)*OWN + C(3)*INDEX*OWN+ C(4)*SIZE + C(5)*DTA + C(6)*CTR

R2 = 0/77 Adj R2 = 0/75 D.W = 1/73

Equation: CAR = C(7) + C(8)*INDEX + C(9)*OWN + C(10)*INDEX*OWN+ C(11)*SIZE + C(12)*DTA + C(13)*CTR

R2 = 0/85 Adj R2 = 0/80 D.W = 2/02

Equation: LTD = C(14) + C(15)*INDEX + C(16)*OWN + C(17)*INDEX*OWN + C(18)*SIZE + C(19)*DTA + C(20)*CTR

R2 = 0/68 Adj R2 = 0/64 D.W = 1/95

According to the results of Table 7, it can be seen that in the equation where the equity to total assets ratio (PR) is the dependent variable:

□ Interest rate suppression (INDEX) has had positive effects on the equity to total assets ratio index in the selected banks under study, so that for a one percent increase in the interest rate suppression index, the equity ratio variable obtained by dividing equity by total assets will increase by 0.01 percent. This conclusion has been confirmed based on the studies of Coelho, Restoy, and Zemil in 2023.

□ Financial inclusion (OWN) has had positive effects on the equity to total assets ratio index in the selected banks under study, so that for a one percent increase in the financial inclusion index, the equity to total assets variable will increase by 0.25 percent. It is also observed that this effect was significant at the 99 percent confidence level. The

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results of this study are consistent with studies conducted by Trator in 2021 and Django, Madaleno, and Botelho in 2022.

☐ The interactive variable of interest rate suppression with financial inclusion (INDEX*OWN) has had positive effects on the equity to total assets ratio index in the selected banks under study, such that for a one percent increase in the interactive index of interest rate suppression with financial inclusion, the equity to total assets ratio variable will increase by 0.03 percent. It is also observed that this effect was significant at the 99 percent confidence level. In the interaction of two opposing forces, the reduction in banking operations under the influence of interest rate suppression and the improvement and increase in banking operations under the influence of financial inclusion, ultimately led to an improvement in the equity ratio in banks under the conditions of interest rate suppression. An increase in this ratio is considered a positive indicator in the evaluation of banking operations and indicates an increase in the profitability and productivity of the bank. The results of this study are consistent with studies conducted by Ghosh in 2022.

☐ Bank size (Size) has had positive effects on the equity to total assets ratio index in the selected banks under study, so that for a one percent increase in the bank size index, the equity to total assets ratio variable will increase by 0.0 percent. It is also observed that this effect was significant at the 99 percent confidence level. In general, it is expected that with the growth of banks and the increase in banking operations and equity growth in banks, the equity ratio in the bank will increase if other factors remain stable. ☐ Deposit to Assets (DTA) ratio has had negative effects on the equity to total assets ratio index in the selected banks under study, so that for a one percent increase in the deposit to asset ratio index, the equity to total assets ratio variable will decrease by 0.18 percent. It is also observed that this effect was significant at the 99 percent confidence level. Since the loan to deposit ratio (LTD) is a vital criterion for measuring the liquidity and financial health of a bank; Increasing the ownership ratio may encourage banks to issue more loans and thus increase the LTD ratio. As a result, as banks lend more, the ratio of deposits to total assets may decrease. This change often reflects a strategic decision to increase profitability by granting more facilities, which can lead to a decrease in the deposit-to-asset ratio (DiSalvo, Johnston, 2016).

☐ The cost-to-income ratio (CTR) has had a negative effect on the equity-to-total assets ratio index in the selected banks studied, so that for a one percent increase in the cost-to-income index, the equity-to-total assets ratio variable will decrease by 0.13 percent. It is also observed that this effect was significant at the 95 percent confidence level. In general, the ownership structure does not directly determine the cost-to-income ratio; usually, factors such as bank size, ownership concentration, and risk-taking behavior influenced by ownership can affect the bank's ability to control costs relative to income. Private banks with dispersed ownership have the strongest incentives to minimize their cost-to-income ratio. Larger banks also have lower cost-to-income ratios due to economies of scale and better resource allocation (Changjun, Uy Houk, Rahman, Nadeem Ashraf, 2017).

Table 7 - Equity to Total Assets Ratio (PR)

Financial inclusion affects the relationship between interest rate suppression and .ownership position (PR) in banks					
Explanation	Interactive variable of interest rate suppression with financial inclusion (INDEX*OWN)	Financial Inclusion (OWN)	Interest rate suppression (INDEX)	Formula	Variable
In an environment of interest rate suppression, financial inclusion will improve the equity-to-total assets ratio	It has a positive .effect	It has a positive .effect	Direct relationship	Shareholders' Equity/Total Assets	Property Ratio (PR)

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Financial inclusion affects the relationship between interest rate suppression and .ownership position (PR) in banks			
Effect level	Type of effect	Factor	Variable
-0.0003	Has a negative effect	Interest rate suppression as affected by banking volume	Property Ratio (PR)
0.0025	Has a positive effect	Financial inclusion as affected by banking volume	
0.03	Has a positive effect	Interaction variable Interest rate suppression with financial inclusion as affected by banking volume	
In conditions of interest rate suppression, financial inclusion will improve the ratio of equity to total assets, taking into account the volume of .banking operations		Explanation	

According to the results of Table 8, it can be seen that in the equation where the capital adequacy ratio (CAR) is the dependent variable:

☐ Interest rate suppression (INDEX) has had positive effects on the capital adequacy ratio index in the selected banks under study, so that for a one percent increase in the interest rate suppression index, the capital adequacy ratio variable will increase by 0.10 percent. It is also observed that this effect was significant at the 99 percent confidence level. The capital adequacy ratio is calculated by dividing the capital base by the total assets weighted by risk factors. According to studies, interest rate suppression does not directly affect bank capital adequacy and generally affects bank capital adequacy ratio by affecting factors such as liquidity, loan quality, and economic conditions. Therefore, in the context of interest rate suppression, due to a significant decrease in banking operations under the influence of pressure on the bank's profitability margin and increased risk of its activity and contraction in macroeconomic conditions, the total banking operations, i.e., receiving deposits and paying facilities, decrease. Ultimately, the bank's risk-taking decreases sharply from its optimal levels and results in a numerical increase in the capital adequacy ratio. This result is consistent with the findings of Setiawan and Mochet in 2021 under the article "Investigating Factors Affecting the Capital Adequacy of Banks in the Indonesian Stock Exchange."

☐ Financial inclusion (OWN) has had positive effects on the capital adequacy ratio index in the selected banks under study, so that for a one percent increase in the financial inclusion index, the capital adequacy ratio variable will increase by 0.08 percent. It is also observed that this effect was significant at the 99 percent confidence level. Financial inclusion has a positive effect on their capital adequacy ratio by creating new revenue streams for banks by increasing their service provision, reducing the overall risk level of banks due to the elimination of concentration in granting facilities, increasing the level of financial stability in banks due to the reduction of the systematic risk of the industry, etc. In general, financial inclusion improves the stability and operational efficiency of banks and ultimately the bank's capital adequacy ratio. The results of this study are consistent with studies conducted by Trator in 2021 and Django, Madaleno, and Botelho in 2022.

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☐ The interactive variable of interest rate suppression with financial inclusion (INDEX*OWN) has had positive effects on the capital adequacy ratio index in the selected banks under study, so that for a one percent increase in the interactive index of interest rate suppression with financial inclusion, the capital adequacy ratio variable will increase by 0.02 percent. It is also observed that this effect was significant at the 99 percent confidence level. In the interaction of two opposing forces, the reduction of banking operations under the influence of interest rate suppression and the improvement and increase of banking operations under the influence of financial inclusion, ultimately in the conditions of interest rate suppression; financial inclusion has improved the capital adequacy ratio in banks. The increase in this ratio is considered a positive indicator in the evaluation of banking operations and indicates an increase in the profitability and productivity of the bank.

☐ Bank size (Size) has had positive effects on the capital adequacy ratio index in the selected banks under study, so that for a one percent increase in the bank size index, the capital adequacy ratio variable will increase by 0.04 percent. It is also observed that this effect was significant at the 95 percent confidence level. In general, it is expected that as banks grow larger and banking operations increase and equity in banks grows, the capital adequacy ratio in the bank will increase if other factors remain stable.

☐ Deposit-to-asset ratio (DTA) has a positive effect on the capital adequacy ratio index in the selected banks studied, such that for every one percent increase in the deposit-to-asset ratio index, the capital adequacy ratio variable will increase by 0.01 percent. It is also observed that this effect is significant at the 99 percent confidence level. When a bank increases its deposits, it effectively increases its capital base. Since CAR is a ratio of capital to risk-weighted assets, an increase in deposits (which are considered liabilities) can lead to a proportional increase in the capital available to support these deposits, thereby strengthening CAR. This conclusion was also reached in studies conducted by Hayes and Kindest in 2022.

☐ Cost-to-income ratio (CTR) has had negative effects on the capital adequacy ratio index in the selected banks studied, so that for a one percent increase in the cost-to-income index, the capital adequacy ratio variable will decrease by 0.13 percent. It is also observed that this effect was significant at the 99 percent confidence level. An increase in the cost-to-income ratio affects the capital adequacy ratio due to the relationship between operational efficiency, profitability, and capital reserves in banks. An increase in the cost-to-income ratio can lead to a decrease in profitability and operational inefficiency, which negatively affects the capital adequacy ratio. This relationship confirms the importance of effective cost management to maintain profitability and regulatory compliance in the banking sector. These results are consistent with studies conducted by many researchers, including Frank Antoine in 2019.

Table 8- Capital Adequacy Ratio (CAR)

Financial inclusion affects the relationship between interest rate suppression .and capital adequacy ratio (CAR) in banks					
Description	Interactive variable of interest rate suppression with financial inclusion (INDEX*OWN)	Financial Inclusion (OWN)	Financial Inclusion (OWN)	Formula	Variable
In conditions of interest rate suppression, financial inclusion will improve the capital .adequacy ratio	It has a positive .effect	has a positive impact	has a positive impact	Base capital of each bank/Risk-weighted assets	Capital Adequacy Ratio (CAR)

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Financial inclusion affects the relationship between interest rate suppression and capital .adequacy ratio (CAR) in banks			
Effect level	Type of effect	Factor	Variable
-0.003	Has a negative effect	Interest rate suppression as affected by banking volume	Capital Adequacy Ratio (CAR)
0.0008	Has a positive effect	Financial inclusion as affected by banking volume	
0.02	Has a positive effect	Interaction variable Interest rate suppression with financial inclusion as affected by banking volume	
In conditions of interest rate suppression, financial inclusion will improve the capital adequacy ratio, given the volume of banking .operations		Explanation	

According to the results of Table 9, it is observed that in the equation where the ratio of total facilities to total deposits (LTD) is the dependent variable:

☐ Interest rate suppression (INDEX) has had negative effects on the ratio of total facilities to total deposits in the selected banks under study, such that for every one percent increase in the interest rate suppression index, the ratio of total facilities to total deposits will decrease by 0.03 percent. It is also observed that this effect was significant at the 95 percent confidence level. In conditions of interest rate suppression, most depositors withdraw their funds from the bank to benefit from parallel markets to preserve the value of their money against inflation. This behavior is especially evident among retail depositors who have more options. As a result, banks may face a decrease in deposit inflows, which is very important for financing loans. Therefore, as deposits leave the bank, the volume of facilities granted decreases more sharply and the total ratio of facilities to deposits decreases. This conclusion has also been proven based on the studies of Holton, Borlon, Gianetti, and Altavilla in 2019.

☐ Financial inclusion (OWN) has had positive effects on the ratio of total loans to total deposits in the selected banks studied, so that for every one percent increase in the financial inclusion index, the ratio of total loans to total deposits will increase by 0.01 percent. It is also observed that this effect was significant at the 95 percent confidence level. Financial inclusion strengthens the banking sector by increasing the deposit base, diversifying risks, increasing intermediation efficiency, creating stability in times of crisis, and improving the effectiveness of monetary policy. These factors collectively help increase the ratio of loans to bank deposits and lead to overall financial stability and economic growth. This conclusion has also been reached by the studies of Ali Rezazadeh, Shahab Jahangiri, and Fahmieh Fattahi in an article titled The Effect of Financial Inclusion on Financial Cycle Shocks.

☐ The interactive variable of interest rate suppression with financial inclusion (INDEX*OWN) has had positive effects on the ratio of total facilities to total deposits in the selected banks under study, so that for a one percent increase in the interactive index of interest rate suppression with financial inclusion, the ratio of total facilities to total deposits will increase by 0.01 percent. It is also observed that this effect was significant at the 90 percent confidence level. In the interaction of two opposing forces, the reduction in banking operations under the influence of interest rate suppression and the improvement and increase in banking operations under the influence of financial

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inclusion, ultimately, in the interest rate suppression conditions, the ratio of facilities to deposits in banks has improved. An increase in this ratio is considered a positive indicator in the evaluation of banking operations and indicates an increase in the profitability and productivity of the bank. ☐ Bank size (Size) has had positive effects on the ratio of total facilities to total deposits in the selected banks under study, so that for a one percent increase in the bank size index, the ratio of total facilities to total deposits will increase by 0.09 percent. It is also observed that this effect was significant at the 95% confidence level. In general, it is expected that as banks grow in size and increase banking operations and equity growth in banks, the loan-to-deposit ratio in the bank will increase if other factors remain constant.

☐ The deposit-to-asset ratio (DTA) has had positive effects on the ratio of total loans to total deposits in the selected banks under study, so that for a one percent increase in the deposit-to-asset ratio, the variable of the ratio of total loans to total deposits will increase by 0.22 percent. It is also observed that this effect was significant at the 90% confidence level. The interaction mechanism of these two ratios is summarized in increasing the lending capacity of the bank. When a bank has a higher deposit-to-asset ratio, it indicates a stable source of financing. This stability allows the bank to increase its lending activities because it has more deposits for savings loans. As a result, as deposits grow relative to assets, the bank can issue more loans, thereby increasing the loan-to-deposit ratio (Murphy, 2022).

☐ The cost-to-income ratio (CTR) has had negative effects on the total loan-to-deposit ratio index in the selected banks studied, such that for every one percent increase in the cost-to-income index, the total loan-to-deposit ratio variable will decrease by 0.46 percent. It is also observed that this effect was significant at the 99 percent confidence level. When a bank's CTR increases, it usually means that a larger portion of its income is consumed by operating expenses. This condition can limit the bank's ability to lend, as it may need to maintain capital to manage its expenses. As a result, the total loans (facilities) available may decrease relative to deposits held, leading to a decrease in the ratio of loans to deposits (Capletti, Ibanez, 2021).

Table 9 - Ratio of Total Loans to Total Deposits (LTD)

Financial inclusion affects the relationship between interest rate suppression and .the status of facilities (LTD) in banks					
Description	Interactive variable of interest rate suppression with financial inclusion (INDEX*OWN)	Financial Inclusion (OWN)	Interest rate suppression (INDEX)	Formula	Variable
In conditions of interest rate suppression, financial inclusion will improve the ratio of total loans to .deposits	It has a positive .effect	It has a positive .effect	Negative relationship	Total facilities/total deposits	Total facilities to total deposits (ratio (LTD)

Financial inclusion affects the relationship between interest rate suppression and the status of .facilities (LTD) in banks			
Effect level	Type of effect	Factor	Variable
-0.03	Has a negative effect	Interest rate suppression as affected by banking volume	Ratio of total facilities to

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0.01	Has a positive effect	Financial inclusion as affected by banking volume	total deposits (LTD)
0.01	Has a positive effect	Interaction variable Interest rate suppression with financial inclusion as affected by banking volume	
In conditions of interest rate suppression, given the volume of banking operations, financial inclusion will improve the ratio of total facilities .to deposits		Explanation	

5- DISCUSSION AND CONCLUSIONS

Based on what has been discussed in this study; interest rate suppression is conceptually at odds with financial inclusion and reduces the profitability of the banking system, increases bank loan defaults, changes lending patterns, and exacerbates wealth inequality. The banking sector in Iran has been severely affected by financial repression policies; studies show that these policies significantly reduce the lending power of banks, as they often have to operate under negative real interest rates, which leads to reduced profitability and increased non-performing loans. Imposing mandatory facilities on banks further strains their balance sheets and limits their ability to lend effectively. Interest rate suppression in Iran reflects a complex interaction of government policy aimed at stabilizing the economy in the midst of inflation and currency crisis. While recent increases in interest rates may have mitigated the short-term consequences of financial repression, the longer-term consequences of this repression continue to pose challenges for the banking sector and the economy more broadly. The effectiveness of these measures remains a point of contention among economists, highlighting the need for a balanced approach to monetary policy that promotes both stability and growth. Based on the results of the equity ratio study, it can be concluded that financial inclusion in the context of interest rate repression has increased stability and reduced bank risk. Financial inclusion can strengthen the stability of banks by diversifying their funding sources. When banks expand their customer base to include previously unbanked populations, they can mobilize more deposits. This increase in the deposit base provides banks with cheaper funding options and thus reduces their risk of failure, especially in an environment of suppressed interest rates where traditional income from loans is reduced. Based on the results obtained from examining the capital adequacy ratio and equity ratio, it can be concluded that financial inclusion in the context of suppressed interest rates improves bank performance. In an environment of suppressed interest rates, banks face pressure on their profit margins. However, financial inclusion allows banks to reach new markets, which leads to increased operating volumes and higher profitability potential. A broader customer base can help banks maintain or even increase their financial performance despite the challenges posed by low interest rates. Based on the results obtained from examining the loan-to-deposit ratio, it can be concluded that financial inclusion in the context of suppressed interest rates has increased demand for financial products. By reducing interest rates, borrowing costs are reduced, which can stimulate demand for loans and other financial products. Financial inclusion schemes can facilitate this demand by providing access to credit to disadvantaged populations. As more individuals and businesses engage with formal financial services, banks can benefit from increased lending activity, which may offset some of the adverse effects of interest rate suppression. Given the research results that showed that financial inclusion affects the relationship between interest rate suppression and bank equity, it is suggested that bank managers consider the moderating effects of financial inclusion on bank equity in the context of interest rate suppression policies pursued by the country's monetary and banking policymakers, so that they can benefit from the benefits of financial inclusion and use the consequences of interest rate suppression to manage bank equity. Financial inclusion affects the relationship between interest rate suppression and the capital adequacy status of banks. It is suggested that national policymakers in the banking sector consider the financial inclusion index in order to improve the capital adequacy ratio of banks. Financial inclusion affects the relationship between interest rate suppression and the status of facilities

in banks. It is suggested that analysts active in the banking market consider the effects of adjusting factors such as financial inclusion and interest rate suppression in the country in order to examine the status of facilities in banks so that they can provide more comprehensive and accurate analyses. It is suggested that other econometric methods such as the ARDL method be used in a study to determine the short-term and long-term model of interest rate suppression in the behavior of banks by focusing on financial inclusion, separated into short-term and long-term periods, so that planning can be done at both short-term and long-term levels. The present study was conducted using data from a statistical sample of selected banks listed on the Tehran Stock Exchange and does not include information from all banks active in Iran, and therefore, in generalizations The results should be generalized to the entire banking system of Iran. The time period of the present study is from 1393 to 1401, therefore, caution should be exercised in generalizing the results to periods before 1393 and after 1401.

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