



## Study of the Relationship between Inflation Rate and Bank Interest Rate in the Iranian Economy

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### ABSTRACT

Experts believe that by lowering the interest rate on bank accounts, total cost of goods and services decreases, and secondly, investment production increases, both of which lead to lower inflation and provide stable employment field, on the other hand, are concerned about the negative effects of lowering the interest rate without lowering inflation and know the underlying requirement of nominal interest rate cuts as lowering the inflation rate, and consequently people's inflation expectations and finally, they know the relative positive nominal interest rate. In this study first the direction of a relationship between inflation rate and the interest rate was determined by Granger causality test; the findings showed that the causality direction is from inflation rate to bank interest rate. Following on from the literature, besides the inflation variable, other variables were estimated as independent variables in the model and finally the functional form of the factors affecting the interest rate for 1978-2018 in the framework Autoregressive Distributed Lag method. The results model showed that inflation rate, legal deposit ratio, exchange rate changes, and land price index have a positive and significant effect on interest rate in the short and long run; However, the effect of the economic growth rate on the bank interest rate has been only confirmed in the long run and also indicate that if an unexpected shock enters a bank interest rate variable, it will take approximately three periods for the effects of this shock to be moderated and the economy to return its original equilibrium.

### Keywords:

Inflation, Causality test, Autoregressive Distributed Lag method.

## 1. Introduction

Bank interest rate is one of the important variables of the economy that is determined by the money market and by money supply and demand. The interest rate, in general, can be interpreted as the opportunity cost of holding money. In terms of cash requirements, the interest rate is the cost of borrowing, and from the perspective of having surplus funds, the interest rate is a loan that you receive for lending. In other words, the interest rate in the economy represents the time value of money (Mehdi Abadi & Mohammadi Pour, 2019). The interest rate should not be set in a grammatical way but should be set according to the supply and demand of money in the financial markets. Although it is not possible to estimate the interest rate due to the lack of transparent and standardized markets, it can be used to determine markets such as mortgage and rental housing markets or mortgage banking market that are affected by interest rates (Jofreh et al., 2012). According to the economic literature, there is a close relationship between inflation and interest rates, and one of the most important determinants of interest rates is inflation. Although it is less important in countries where inflation rates are low and inflation rates are single, but in countries such as Iran with high inflation rates, controlling price growth is considered an important factor influencing interest rates (Sahafi, 2015).

Bank interest rate is one of the important monetary instruments in the economy that monetary authorities with their managed change can stimulate the real part of the economy; for this purpose, it is stipulated in the Fourth Development Plan Act that the interest rate on the account of the banking system facilities become one digit until the end of program and in this regard the banking facilities interest rate law was also adopted, which were supposed to cut 2 percent of interest rates annually on average in the fourth plan year, until the end of the fourth program, the accounting interest rate will be single-digit. The Bank's interest rate cut law is a crossroads of favorable and disagreeable views of bank interest rate cuts. Lawmakers are concerned about lower interest rates, lower investment volume and lower competitiveness of producers in Iran, arguing that lowering interest rates as part of the investment cost can increase investment volume and decrease product prices. This reduces inflation too (Hesami Azizi et al., 2016). Opponents of the law, in return, are concerned about

the negative effects of lowering the interest rate without lowering the inflation rate and see the basic condition for nominal interest rate cuts as lowering inflation rates and, consequently, shifting people's inflation expectations and eventually relative positivity of bank interest rates. Therefore, in their view, the reduction of the bank interest rate is possible only in the long run and in the light of the gradual decline in the inflation rate. The implicit assumption of this argument is the validity of Fisher's theory of the Iranian economy that, in the long run, a decrease in the inflation rate will result in a decrease in the nominal interest rate (Komeijani & Bahrami Rad, 2008).

As can be seen, the main challenge among economists in the country is the effect of the reduction of the bank interest rate on the inflation rate, in other words, the primacy and latency of these two traits on each other. Some experts believe that by lowering the interest rate on bank accounts, the total cost of goods and services decreases, and secondly, investment and consequently production increases, both of which lead to lower inflation and provide stable employment. In return, opponents of the law are concerned about the negative effects of lowering the interest rate without lowering inflation, and see the main and basic condition of nominal interest rate cuts the reduction in inflation rate and consequently the inflation expectations of the people and ultimately the relative positive nominal interest rate (Khajeh Muhammadlu & Khodaveisi, 2017). Given the discussions and the importance of bank interest rate in the conduct of monetary policy by the central bank on the one hand and the controversial problem of bank interest rate stabilization law and the arguments of the proponents and opponents of this law, on the other hand, the present study seeks to first, identify the causal relationship between inflation rate and bank interest rate for the Iranian economy and then model and explain the variables affecting the interest rate in the Iranian economy for the period 1978-2018.

## 2. Literature Review

Studies show that in many countries, in the longrun, there is a positive relationship between the nominal interest rate and inflation rate and the nominal interest rate is a reflection of inflation trends. The positive relationship between the nominal interest rate and the expected inflation is a classical theory attributed to Irving Fisher, known in the economics

literature as the "Fisher effect". Although this relationship was first invented by Thornton in 1802, it was later introduced by Irving Fisher in the form of a coherent theory in the 1930s. In short, the Fisher effect states that a unit increase in expected inflation rate increases the nominal interest rate by one unit and the expected real interest rate remains constant; In other words, in such a situation relation (1) is established:

$$i = r + B\pi \quad , \quad B = 1 \quad (1)$$

Fisher then discusses expectations, in his view the assumption of perfect prediction and the matching of expectations in the short term is ideal, and the more realistic assumption is that know the prediction of the delay, and know expects in the long-term as adaptive. Fisher believed that it would take close to 30 years for the economy to adjust to the new inflation rate, but noted that as the economy progressed and in the new world, day-to-day forecasting would be more complete and faster than expected. Therefore, in the long run, the expected inflation rate will be equal to the real inflation rate.

$$\pi = \dot{p} \quad (2)$$

Fischer, therefore, argues that in the long run, a unit of inflation will increase the nominal interest rate by one unit, while the real interest rate remains the same: hence Fischer argues that in the long run, a unit increase in inflation will increase the nominal interest rate by one unit while the real interest rate remains constant:

$$i = r + B\dot{p} \quad , \quad B = 1 \quad (3)$$

Therefore, the real interest rate is independent of the inflation rate and its determinants are the real economic factors such as productivity and saving (Khajeh Mohammadloo & Khodaveisi, 2017). Post-Keynesian structuralists have shown in less developed countries, especially in the context of economies based on intrinsic money overdraft and interest rates occur simultaneously; In this case, besides the inability of the policy maker to control the interest rate, and thus the inability to influence the interest rate on the bank deposit, when the role of banks as the creator of money (not necessarily its intermediary) or the high-yielding sector in the economy is highlighted. , The

emergence of bank interest rates far above the yields of real producers and far below the yields of the unproductive sector of the economy and distinct from the policy interest rate, causing turmoil in the economy; Also, according to the structuralist view, if the risk and liquidity considerations of commercial banks or the level of competition and hence the value of these banks change with the change in the base interest rate, monetary policy may not be able to directly affect the interest rate in the credit market. In this case, there may be asymmetry; an increase in the base interest rate always leads to an increase in the interest rate in the credit market, as commercial banks must offset re-borrowing costs and have to (at least) make a profit; But if the cash prize and the mere risk of commercial banks increase due to increased uncertainty, or if the banks' level of interest demand rises, a reduction in the base rate may not be immediately associated with lower credit market rates. The fundamentalist position was that there could be a "slippage" between the policy rate and other interest rates. They also believe that liquidity preference plays a role in determining both the level and timing of market interest rates, so that while the money is endogenous, the central bank uses the key interest rate as one of the economic policy tools, but the role of banks and customers in the state of inactivity of the policymaker is significant and decisive. The followers of the school criticize the money supply and credit curves for their excessive elasticity and therefore believe that the interest rate is one of the endogenous variables. It is also believed that commercial banks may have to attract reserves from the community or create financial innovations and may, therefore, enter into a bank interest rate game. Hence, interest rates may rise and money supply curves and credit ratings will rise. In another study of structuralists, they found that in the recession and when the relationship between assets and liabilities of commercial banks declined or weakened, the increase in credit coupled with the bank's commitment to pay dividends reduced the liquidity of commercial banks' assets and it increases the amount of debt to businesses and commercial banks at the same time. Hence, in this case, the increase in credit supply is accompanied by an increase in the liquidity and risk premium of commercial banks, and the preference for liquidity and increased risk actually force commercial banks to

increase the base interest rate and the bank interest rate increases (Mahdavi Mazdeh et al., 2019).

Various studies have been conducted on the relationship between inflation and interest rates both inside and abroad. Abou Noori et al. (2013) examined the relationship between the inflation rate and the interest rate on bank deposits in the Iranian banking system. Cointegration and error correction models have been used in this study. The results show that in the long run there is a significant relationship between the nominal interest rate and inflation rate. In other words, the inflation rate is the result of coincident changes in the nominal interest rate or interest rate deposits; also a case study of Tehran Bank Sepah branches revealed that the inflation rate on the types of deposits has a negative effect but the growth of national income on the rate of types of deposits has a positive effect. Khaje Muhamadlou and Khodaveisi (2017) examined the relationship between exchange rate, inflation rate, and interest rate. In this study, Vector Autoregressive (VAR) and Vector Error Correction (VECM) methods were used and the period of study was 1981-2014. The results of this study showed that in the long-run, the inflation rate had a significant positive effect and the exchange rate had no effect on the interest rate. The short-run relationship also showed that in the short run the exchange rate has a significant positive effect and the inflation rate has no effect on the interest rate.

Based on the results of this study, Fisher's theory of international and international influence on the Iranian economy has been rejected. Mahdavi Mazdeh (2019) evaluated the effects of real and monetary-financial variables on the interest rate of the Iranian bank deposit. In this study, the threshold approach (STAR) was used and the period of study has been 2006-2017. The results of this study showed that variables of the land price index, volume of long-term deposits, and volume of formal and informal imports have a positive and significant effect on the interest rate of bank paid deposit; This indicates that the speculative incentives of banks and customers in the Iranian economy are an important factor in the high bank interest rate. Kanwal et al. (2014) examined the factors affecting the interest rate in Pakistan. The period of this study was 2005-2010, in which the effect of consumer price index (CPI) and the exchange rate on interest rate has been investigated. The results showed that both consumer price index (CPI) and the

exchange rate have had a positive and significant effect on the interest rate. Urbanovský (2017) examined the relationship between variables of interest rate, inflation and economic growth in the Czech Republic. In this study, the Granger causality test and VAR model were used to investigate the relationship between variables. It showed that inflation and economic growth have a positive and significant effect on the interest rate. Lee and Warner (2018) examined the relationship between the interest rate and economic growth in the US and UK countries. The results of the study showed that in all countries, economic growth has had a positive and significant effect on the interest rate in the short and long term. Kapuściński & Pietryka (2019) examined the effect of increasing the legal reserve of the banking sector on the interest rate in Poland. The study period was from 2005 to 2017, using the GARCH model and the VAR panel. The results showed that increasing the legal reserve has a significant and negative effect on banks' interest rate.

#### Research Questions

- *In the long run, does the change in the inflation rate cause the change in the nominal interest rate?*
- *Do inflation and nominal interest rates change in one direction in the long run?*

#### Research Hypotheses

- In the long run, the change in the inflation rate is the cause of the change in the nominal interest rate.
- In the long run, inflation and nominal interest rates change in one direction.

### 3. Methodology

In the present study, the theoretical foundations of the relationship between inflation and bank interest rate were discussed in the previous section. Then, using the Granger causality test and determining the causality direction and the relationship between these two variables, the functional form of the relationship between inflation and bank interest rate is determined, then based on the research literature other variables as independent variables in the model and finally the final functional form designed in the framework of the Autoregressive Distributed Lag method (ARDL) is explained.

Granger causality test and model functional form stipulation

In this study, the Granger causality test is used to investigate the relationship between inflation variables and bank interest rates. This test is one of the most applicable and common methods for examining the causal relationship. Although using the cointegration test it is possible to determine whether or not there is a Granger causality relation between the variables, but this test cannot determine the causal relation direction. Tests of causal relations are to answer questions such as, "Does the change in the x variable lead to the y variable change?" And following the argument that x is the cause of y, the intervals of x in the equation of y must be significant. If this happens, and not vice versa, it is said that x is the granger causal of y or that there is a one-way causal relationship from x to y. If x is the granger causal of y and not vice versa, it is said that the variable x is strongly exogenous, but if neither of the two variables in the equations is statistically significant, x is said to be independent. (Namaki et al., 2014).

Accordingly, in the present study two equations (4) have been defined to identify and explain the causal relationship between inflation and bank interest rate variables:

$$(4) \quad \begin{cases} \text{inflation} = \sum_{i=1}^p \text{inflation}_{t-i} + \sum_{i=1}^p \text{intrest rate}_{t-i} + u_{1t} \\ \text{intrest rate} = \sum_{i=1}^p \text{intrest rate}_{t-i} + \sum_{i=1}^p \text{inflation}_{t-i} + u_{2t} \end{cases}$$

In the above equations, *the intrest rate<sub>t</sub>* indicates the interest rate and *inflation* indicates the inflation rate. By specifying the lag length (P), the relationship is estimated as a constrained and unconstrained model, and the causality relationship between inflation rate and interest rate variables has been identified using Granger causality test and significant coefficients of variables. Then, according to the one-way causality relation from inflation to interest rates, the functional form of the relationship between these two variables has been deduced as Equation (5).<sup>1</sup>

$$\text{intrest rate} = f(\text{inflation}) \quad (5)$$

Mohammadi (2011) showed that if the right-hand variables of the equation, which are generally represented by X, are the cause of the dependent variable, or, in other words, the explanatory variables are not caused by the dependent variables and be endogenous to it, the Autoregressive Distributed Lag method (ARDL) can yield useful results. Therefore, this model is used to estimate the relationship (2), which will be discussed below.

#### Autoregressive Distributed Lag method (ARDL) stipulation

In the present study, other variables such as legal deposit ratio, economic growth rate, exchange rate changes, and land price index as independent variables affecting interest rate are investigated in the short-run and long-run relationship between inflation and interest rate based on the research literature. In order to model the relationship between these variables in the framework of time series modeling according to Fomby point of view (1998), steps must be followed systematically. Therefore, the choice of ARDL method in this study is based on this study. In the ARDL pattern, the variables in the pattern can be I (0) or I (1) but cannot be I (2), so this problem should be addressed by static tests. The ARDL model was first developed by Pesaran and Pesaran (1997) and then was extended by Pesaran and Smith (1998), Pesaran & Shin (1999) and Pesaran and et al (2001). Due to the limitations of using Engel-Granger, Johansen-Josilos and Error Correction Model (ECM), these individuals in their studies have sought to overcome the shortcomings of the above methods seeks better access to analyze long-run and short-run relationships between variables (Ghouse et al., 2018). The advantage of applying the ARDL method over other methods is that, regardless of the static nature of the variables in the model of type (0) I and I (1), one can examine the convergence relationship between the variables (Nkoro & Uko, 2016).

Also for small samples, this method has high explanatory power. Therefore, estimations of the ARDL method are inefficient due to avoid problems such as autocorrelation and endogenous. It also estimates the long-run and short-run relationships between the dependent variable and the other explanatory variables of the model simultaneously (Ghouse et al, 2018). The general framework of the

short-term ARDL model is as the relation (6) by considering all variables affecting the interest rate:

$$\begin{aligned}
 \text{interest rate}_t &= b_0 + \sum_{i=0}^n a_i \text{interest rate}_{t-i} \\
 &+ \sum_{i=0}^n b_{1i} \text{inflation}_{t-i} + \sum_{i=0}^n b_{2i} \text{legal rate}_{t-i} \\
 &+ \sum_{i=0}^n b_{3i} \text{economic growth}_{t-i} + \sum_{i=0}^n b_{4i} \text{exchangerate}_{t-i} \\
 &+ \sum_{i=0}^n b_{5i} \text{landprice}_{t-i} + \gamma_1 \text{inflation}_{t-1} \\
 &+ \gamma_2 \text{legal rate}_{t-1} + \gamma_3 \text{economic growth}_{t-1} \\
 &+ \gamma_4 \text{exchangerate}_{t-1} + \gamma_5 \text{landprice}_{t-1} + u_t
 \end{aligned}
 \tag{6}$$

In the above relation, the interest rate (interest rate) is the dependent variable and variables of inflation (inflation), legal rate, economic growth rate, exchange rate changes, and land price index variables are independent variables. Given that all variables in the equation have been entered as percentages in the model, the coefficients obtained in the model are expressed as elasticity and are interpreted as elasticity. In relation (6), the zero hypotheses based on the existence of a cointegration relation and its opposite hypothesis of the absence of cointegration are tested as follows:

$$\begin{aligned}
 H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0 \\
 H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq 0
 \end{aligned}$$

If some of the variables in the model are of the same order of magnitude, the F statistic for the above cointegration test does not have a standard asymptotic distribution; but regardless of whether the variables are aggregates of order one or zero, Pesaran and Pesaran (1997) and Pesaran et al. (1996 and 2001) Presented the table of critical integers for the test for the number of different regressors. In addition, this table will vary depending on whether the ARDL pattern contains the width of the origin and the process. If the calculated statistic F is higher than the critical value above the upper limit of the table, the zero hypothesis that there is no coincidence is rejected. If the F statistic falls within the range mentioned above, the F test is null and no definitive conclusion can be obtained, and if the F statistic is below the critical lower limit value of the table, the zero hypothesis that there is no

cointegration is accepted. In the ARDL model, if there is a coincidence between the variables in the model, the short-term fluctuations of the variables and the long-run equilibrium values can be correlated. This is possible through the error correction model. The general form of error correction model for relation (6) can be expressed as the relation (7):

$$\begin{aligned}
 \Delta \text{interest rate}_t &= b_0 + \sum_{i=0}^n a_i \Delta \text{interest rate}_{t-i} \\
 &+ \sum_{i=0}^n b_{1i} \Delta \text{inflation}_{t-i} \\
 &+ \sum_{i=0}^n b_{2i} \Delta \text{legal rate}_{t-i} \\
 &+ \sum_{i=0}^n b_{3i} \Delta \text{economic growth}_{t-i} \\
 &+ \sum_{i=0}^n b_{4i} \Delta \text{exchangerate}_{t-i} \\
 &+ \sum_{i=0}^n b_{5i} \Delta \text{landprice}_{t-i} + \partial \text{ecm}_{t-1} \\
 &+ u_t
 \end{aligned}$$

In relation ( $\Delta$ ), the first-order differential operator  $\partial$  measures the speed of the parameter adjustment or the speed of approaching the long-run equilibrium and  $\text{ecm}_{t-1}$  is the residual sentences obtained from the long-run equation estimation. In addition, the ARDL model uses the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) tests to check the stability of the model. These tests plotted the cumulative values of the residuals over time that, if they were within 5 percent of the critical line spacing, would represent the stability and reliability of the model coefficients in the long run. By explaining the variables and patterns used in the present study, all the steps involved in performing the tests and estimating the models are performed using the software package. Also, the information required for the present study is related to the time period of 1978-2018, which has been collected by referring to the statistics of the Central bank of Islamic Republic of Iran.

#### 4. Results

Before estimating econometric models in order to avoid false regression, the variables' stability is examined first. In addition, as mentioned in the

previous section, in the ARDL model the variables in the template must be I (0) or I (1) and cannot be used in cointegrate from higher degrees. Therefore, before estimating the model and examining the results, the reliability of the variables in the model was first evaluated using the Phillips-Peron (PP) test. Table (1) shows the results of this test in the model with intercept. Based on the results of this test, considering

that the probability level of the variables or their first-order difference is less than the probability level of 0.05, it can be said that all variables, including dependent and independent variables during the research period at the level or with a one-time difference are static; in other words, they are groups of zero or one rank I (0) or I (1).

**Table (1): the study of statics of research variables using PP test**

Variables	Symbol	ADF test		Results
		Statistics	Probability	
Interest rate	intrestrate	001,-1	497,0	Unstable
First order difference of interest rate	dintrestrate	837,-7	0,0,0	Stable
inflation	inflation	371,-3	0,18,0	Stable
First order difference of inflation	dinflation	110,-10	0,0,0	Stable
Legal deposit ratio	legalrate	370,-1	084,0	Unstable
First order difference of legal deposit ratio	dlegalrate	087,-7	0,0,0	Stable
Economic Growth Rate	economicgrowth	494,-4	0,0,0	Stable
First order difference of Economic Growth Rate	deconomicgrowth	987,-12	0,0,0	Stable
Changes in exchange rates	exchangerate	267,-1	730,0	Unstable
First order difference of Changes in exchange rates	dexchangerate	287,-3	0,22,0	Stable
Land price index	landprice	039,1	747,0	Unstable
First order difference of land price index	dlandprice	940,-2	041,0	Stable

Reference: Research findings

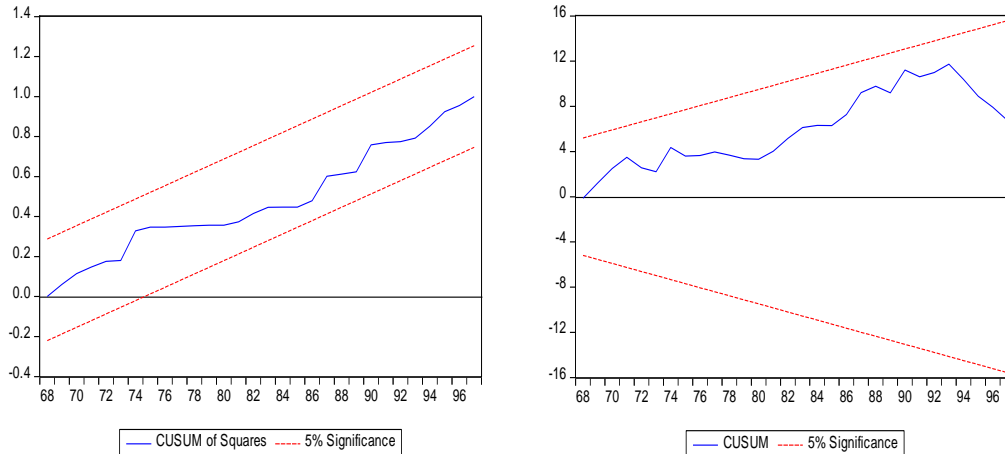
In the regression model, there is a set of assumptions called classical assumptions about residuals (model error) and in order for estimators of regression coefficients to be the best estimators without linear bias, these assumptions need to be examined and tested. Therefore, after the static analysis of the variables, linear regression assumptions have been studied and evaluated before the results of the ARDL model are presented. The results of the assumptions or, in other words, the validation components of the ARDL model are reported in Table 2; As can be seen from the results,  $\bar{R}^2$  indicates the high explanatory power of the model, and the significance of the F statistic at a 100% level confirms the overall significance of the model and with the confidence of 100%, the zero hypotheses that all the coefficients of the model are zero is rejected. Also, the results of heteroscedasticity, autocorrelation and normality variance tests show that there is no heteroscedasticity and autocorrelation variance in the model and disturbed sentences have a normal distribution.

**Table 2: Results of the accreditation components of the ARDL model**

Test	Statistics	Hypothesis
autocorrelation between disturbing sentences (LM)	148)0.929 (.1)	Reject of $H_0$
Normality (JB)	117)0.008 (.2)	Reject of $H_0$
homoscedasticity (LM)	739)0.707 0.	Reject of $H_0$
0,0,0).448(0.20F =	8880. =R2	449. = $\bar{R}^2$

Reference: Research findings

Cumulative Sum (Cusum) and Cumulative Sum of Squares (Cusumsq) tests are used to evaluate the stability of the estimated model parameters in linear regression models. An important feature of this test is that it can be used even when there is uncertainty about structural change. Accordingly, these two tests have been used in the present study to investigate the stability of the relationships and parameters of the research regression model and to ensure the validity of the results. Diagram (1) shows the results of these tests. According to the results and the stay on statistics of the two mentioned tests between the boundary lines, it can be said that there is no structural failure in the regression model and the estimated parameters of the model are stable.



**Diagram (1): Cusumq and Cusumsq test results to investigate the stability of parameters in the first regression model of research.**

Reference: Research findings

In the present study, in order to determine the number of optimal interruptions, since in the regression model, the data under study are less than 100, the SCB criterion was used and the optimal interrupt number for the model has been determined maximum one. After determining the optimal number of interrupts, a boundary test has been performed to investigate whether or not there is a long-run relationship between variables. The boundary test results for the research regression model has been reported in Table (3). The boundary test results, along with the upper and lower limit values that have been presented by Pesaran et al. (2001), show that the F statistic for the model is 4.380 which exceeds the critical upper limit F value at the 5% level. Therefore, the zero hypotheses that there is no long-run relationship between the model variables is rejected at a 95% confidence level, ie the variables of interest rate, inflation rate, legal deposit ratio, economic growth rate, exchange rate changes, and land price index are coherent and therefore there is a long-run relationship between the dependent variable and the independent variable of the model.

**Table (3): Boundary test results to investigate cointegration relation (long term)**

Computational F statistics	Critical values of F-boundary test at 5% level	
	I(1)	I(0)
4.380	3.83	3.92

Reference: Research findings

The results of estimating the short-run and long-run patterns of the research regression model are presented in Table (4). According to the results of inflation, both the short and the long run have a positive and significant effect on the interest rate. The coefficient of this variable is obtained positive in the short and long term pattern and is equal to 0.005 and 0.171, respectively. Since these values are less than probability level of 0.05, the assumption of zero at a 95% confidence level is accepted. This means that there is a positive significant relationship between inflation and interest rate. Concerning this result, it should be acknowledged that, according to macroeconomic literature, if prices rise, the first variable influencing price increases is the real balance of the money. In other words, as prices rise, the real money supply declines. In the framework of Keynesian analysis, the decline in real money supply (surplus money demand) causes disturbances in the economy. According to the Walrasian equilibrium, in order to balance the economy as a whole, a surplus of



money demand in the money market creates a surplus in the supply market which reduces the price of bonds and increases the market interest rate. Thus, theoretically, interest rates are expected to rise as prices rise. In other words, an increase in the inflation rate can provide an increase in the interest rate in the economy.

According to the results, the legal deposit ratio has a positive and significant effect on the interest rate, both in the short and long term. The coefficient of this variable in the short-run and long-run pattern is obtained positive and is equal to 0.099 and 0.215, respectively; Since these values are less than the probability level of 0.05, the assumption of zero at 95% confidence level is accepted. This means that there is a positive significant relationship between the legal deposit ratio and the interest rate. Concerning the obtained result, it should be acknowledged that the statutory reserve rate is ordered by the monetary authorities to the banking system. Monetary authorities are using this tool to influence how money is spent in the economy and change the volume of money in the economy. High statutory reserves increase interest rates. As a result, banks need to attract more deposits, which will lead to higher deposit rates, in order to realize the statutory reserves without reducing credit spreads. Increasing the final financial cost will, in turn, lead to an increase in the loan rate and interest rate. In this regard, if the central bank determines the price of money and targets a particular interest rate, it will have completely different effects from the increase in statutory reserves; In order to counter the potential deviation of the policy rate from the target, the central bank increases its monetary base and thereby mitigates the contractual effects of statutory reserves. Therefore, an increase in statutory reserves reduces the monetary coefficient. If monetary authorities keep the monetary base stable, an increase in legal reserves will reduce the volume of money and increase the interest rate. Based on the results of the economic growth rate, it has a positive and significant effect on the interest rate, both in the short and long run. The coefficient of this variable in the short-run and long-run pattern is positive and is equal to 0.055 and 0.105, respectively. Since these values are smaller than the probability level of 0.05 and 0.10, the assumption of zero at 95 and 90% confidence level is accepted. This means that there is a positive significant relationship between economic growth rate and interest rate. Concerning the

obtained result, it must be acknowledged that increasing economic growth means improving production conditions; in that case, companies' incentives to expand their business increase, but companies need to reinvest in order to expand their business and increase production capacity that one of the major sources of financing is the banking system; therefore, the demand for loans increases and as demand for funds exceeds supply, it is expected that the interest rate at which banks make payments will increase. According to the results of the exchange rate changes, both the short and the long run have a positive and significant effect on the interest rate.

The coefficient of this variable in the short-run and long-run pattern is positive and equal to 1.442 and 3.112, respectively. The probability value (significance level) of the t-test for this variable in the short-run and the long-run pattern is obtained as 0.002 and 0.000, respectively; because these values are less than probability level of 0.05, the assumption of zero at 95% confidence level is accepted. This means that there is a positive significant relationship between the exchange rate and interest rate changes. Concerning the result, it should be acknowledged that the gap between the official and informal exchange rates provides a safe margin for the formation of the arbitrage phenomenon, which itself can act as a competitor to the rising bank interest rate and inflation anchor. Various studies have shown that in the event of a currency shock, the interest rate to defend the currency will rise by the banking system, and even the exchange rate will become an anchor for rising interest rates and inflation. Based on the results of the land price index, it has a positive and significant effect on the interest rate, both in the short and long run. The coefficient of this variable is positive in the short and long term pattern and is 0.076, 0.091 and 0.033, respectively. The probability level (significance level) of the t-test for this variable in the short-run and long-run pattern is obtained as 0.023, 0.007 and 0.001, respectively; Since these values are less than the probability level of 0.05, the assumption of zero at 95 and 90% confidence level is accepted. This means that there is a positive significant relationship between the land price index and interest rate. Concerning the result, it should be acknowledged that the housing market is the main competitor of the money market in attracting investors. When creating a boom in the housing market, a significant proportion of depositors,

in the hope of earning higher profits and retaining the real value of their assets, consider investing in the property market as appropriate. In such a situation,

banks increase the bank interest rate in order to prevent the transfer of resources from the banking sector to the housing market.

**Table (4): Results of (1, 1, 0, 1, 1, 0) ARDL model estimation of research regression model**

Short-term pattern				
Variable	Symbol	Estimation coefficient	T statistics	Probability
intercept	c	110.0	0.90.0	928.0
First order difference of interest rate	Interstate(-1)	037.0	109.4	0.00.0
rate inflation	inflation	000.0	139.0	890.0
First order difference of inflation rate	Inflation(-1)	074.0	004.2	017.0
Legal deposit ratio	legalrate	099.0	321.2	027.0
Economic Growth Rate	economicgrowth	007.0	287.0	777.0
The first-order difference of economic growth rate	Economicgrowth(-1)	000.0	000.2	017.0
Changes in exchange rates	exchangerate	442.1	241.3	002.0
Land Price Index	landprice	077.0	383.2	023.0
First order difference of land price index	landprice(-1)	091.0	871.2	0007
Long-term pattern				
Variable	Symbol	Estimation coefficient	T statistics	Probability
inflation	inflation	171.0	024.2	034.0
Legal deposit ratio	legalrate	210.0	124.2	042.0
Economic Growth Rate	economicgrowth	100.0	771.1	088.0
Changes in exchange rates	exchangerate	112.3	440.4	000.0
Land Price Index	landprice	033.0	702.1	100.0

Reference: Research findings

The ARDL model typically uses an error correction model (ECM) to evaluate the speed of adjustment or, in other words, the speed to move to the long-run equilibrium. The existence of cointegration or, in other words, the long-run relationship between a set of economic variables provides the basis for applying the error correction model. The error correction model actually relates the short-run oscillations of the variables to their long-run equilibrium values and shows the speed of adjustment and the move to long-run equilibrium. The results of estimating the error correction model (ECM) for the regression model under consideration are presented in Table (5). The evaluation of the results of the above table shows that the coefficient of error correction according to the expected is negative, smaller than one and is statistically significant. The value of this coefficient is -0.463, indicating that 46.3% of the interest rate equilibrium disappears from its long-run values after a period. The results show that the rate of adjustment to the long-run equilibrium in the model is relatively slow; Accordingly, if due to any shock in the

model economy the initial equilibrium is removed, it will take approximately three periods before the short-term imbalance is corrected and the model returns to the original long-term equilibrium.

**Table 5: Results of Error Correction Model Estimation (Ecm (-1))**

Coefficient	T statistics	Probability
463.0	060.7	000.0

Reference: Research findings

## 5. Discussion and Conclusions

In the Fourth Development Plan Act has been forecasted that on account interest rate of the banking system facilities of the country will be one digit until the end of the program, in particular, the Bank's interest rate rationale law was adopted and it was planned to cut interest rates by an average of 2% per annum during the fourth year of implementation, until at the end of the program, on account interest rate will

be one digit. Some experts believe that by lowering the bank interest rate, the finished cost of goods and services decreases, and secondly, investments and therefore production increase, both of which will lead to lower inflation and provide sustainable employment. Opponents, on the other hand, are concerned about the negative effects of lowering interest rates without lowering inflation and see the basic condition for nominal interest rate reducing inflation rates, and hence people's inflation expectations and eventually relative positivity of nominal interest rate. Since the results of the law of the rationalize interest rate of banking facilities are directly related to the priming and latency effects of two bank interest rates and inflation rate, the present study first examined the relationship direction between inflation rate and interest rate using Granger causality test. In this regard, the findings of the Granger causality test showed that the causality direction is from the inflation rate to the bank interest rate. Then in the second step based on the research literature besides the inflation variable other variables were considered as independent variables in the model and the final functional form of the factors affecting the interest rate for the period of 1978-2018 in the framework of the Autoregressive Distributed Lag method (ARDL) estimated. Modeling results of ARDL model showed that inflation rate, legal deposit ratio, exchange rate changes, and land price index have a positive and significant effect on interest rate in the short and long run; However, the effect of the economic growth rate on the interest rate has been only confirmed in the long run. The results also indicate that if an unexpected shock enters a bank interest rate variable, it will take approximately three periods before the effects of the shock and the economy return to their original equilibrium. The results of this study are in line with the results of Khajeh Mohammadlou and Khodaveisi (2017), Mahdavi Mazdeh et al. (2019), Kanwal et al. (2014), Arbanovsky (2017) and Lee & Warner (2018).

According to the findings of the present study, it seems that the opposition's view of reducing the bank interest rate can be confirmed; Therefore, it can be said that Fisher's theory holds true for the Iranian economy and policymakers should be aware that lowering the bank interest rate only in the long run and in the light of the gradual decline in the inflation rate will have positive consequences for the economy. In this regard, the central bank can concentrate on inflation control in

its policy package because it will be able to control interest rates as well as positively affect investment and economic growth. Also, given the positive and significant effect of the exchange rate and the price index in the short and long term on the interest rate, bank managers and financial policymakers of the country should be aware that the currency market and the housing market are the main competitors of the money market in attracting investors. Therefore, if a boom in the currency or housing market is created, a significant portion of the depositors, in the hope of earning higher profits and maintaining the real value of their assets, consider investing in the property and currency market as appropriate. In such a situation, banks increase the bank interest rate in order to prevent the transfer of resources from the banking sector to the housing market. In this regard, it is recommended to reform the structure of parallel markets, rationalize profits in these markets and control speculative incentives through continuous central bank monitoring and monitoring. Finally, given the positive effect of the ratio of statutory reserves on the interest rate, it is recommended that the central bank set the rationalization of the legal deposit rate, taking into account the money supply coefficient and the volume of liquidity required by the economy; It increases the resources available to banks and thereby improves the lending power of banks and thus improves the production and employment situation in the country.

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**Appendix 1**

Table 1- Granger causality test between inflation and bank interest rate

Equations	H <sub>0</sub> Hypothesis	F test	Probability	Accept or reject of H <sub>0</sub>	Direction of causality
intrestrate~inflation	intrestrate $\nleftrightarrow$ inflation	۷۰۳.۴	۰۳۰.۰	Reject of H <sub>0</sub>	One way from intrestrate $\nleftrightarrow$ inflation
inflation~intrestrate	inflation $\nleftrightarrow$ intrestrate	۱۳۸.۷	۱۴۳.۰	Accept of H <sub>0</sub>	

Reference: Research Findings

**Note**

<sup>1</sup> The results of the Granger causality test in each of the two states has been studied and the related statistics are presented in Table 1 of the appendix.