Effect of Lending Rate and Deposit Interest Rate on Inflation to the Economy of Bangladesh: An Assessment from 1990 to 2022

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Abstract: *One of the major important targets for any developing country like Bangladesh, is to achieve consistently high economic growth. Though there are many factors that affect economic growth, this paper discussed the effect of lending rate and deposit rate on inflation of Bangladesh over specific period. Inflation, lending rate and interest rate or Deposit rate are three important macroeconomic indicators as they play vital role on economic growth of any country. The relation among inflation, landing rate and deposit interest rate of 32 years of Bangladesh is analyzed to determine the effect of lending rate and deposit interest rate on inflation. This study is to investigate how lending rate and deposit interest rate influence the inflation of economy of Bangladesh over the stipulated period. An Ordinary Least Square (OLS) model and unit root test are applied to find out the correlation and co-integration related to the discussed three indicators. The research time series data were collected from 1990 to 2022 from the World Bank data website. A lot of controversies and literatures have earlier analyzed this relationship. In context of Bangladesh, very few studies have been done in this regard. This study is done with an objective to determine the effect of inflation on lending rate of Bank loan and banks' deposit interest rate in Bangladesh. The inflation, lending rate and deposit interest rate satisfy Dickey Fuller Test. All data are stationery at first difference level. The dependent variable inflation rate is regress with the independent variable interest rate and deposit rate.*

Keywords: Inflation, Lending rate, interest rate, Bank interest.

1. Introduction

Inflation is one of key factors in things that affect interest rates of banks and interest rate of lending money has direct impact on deposit rate at which banks collected money from markets. When a surge in inflation occurs, a corresponding increase in interest rates takes place. If the prices of things tend to significantly increase, then the value of money decreases. In this situation, those who lend money to the businesses very aware that inflation will grind down the value of their money in the span of the lending money period or loan period. Lenders increase interest rates to compensate for this type of loss. On the other hand, to tame the inflationary trend, government of a country might increase interest rate to control money supply in the markets. To attract more deposit from markets banks may increase deposit rate for supporting people daily expenses. Thus a correlation among inflation, lending rate and deposit rate may found at financial markets. Inflation is followed by the interest rate fallowed by deposit rate in general. But, the extent to which one affects the other for different time periods is not certain. According to Fisher hypothesis, introduced by Irving Fisher in 1930 defines that the nominal interest rate is the sum of the constant real rate and the expected decline in the purchasing power of money. Fisher hypothesis determines the relationship between the expected inflation and interest rates of the financial markets. Many previous studies show that there is a positive relationship between interest rate and inflation. For skyrocketing inflation deposit rate might be increased to cope up the excessive price demand. Several studies have shown that Fisher hypothesis is true and applicable in Bangladesh economy and that there is along run relationship between interest rates and inflation rates. Fisher hypothesis is the proposition that the real interest rate is independentof

monetary measures, especially the nominal interest rate. In financial mathematics and economics, the Fisher equation expresses the relationship between nominal interest rates, real interest rates, and inflation. Named after Irving Fisher, an American economist, it can be expressed as real interest rate ≈ nominal interest rate − inflation rate.[1] In more formal terms, where r equals the real interest rate, i equals the nominal interest rate, and π equals the inflation rate, then $(1 + i) = (1 + r)(1 + \pi)$. The approximation of is often used instead since the nominal interest rate, real interest rate, and inflation rate are usually close to zero.[2] Here all the rates are continuously compounded. For simple interest rates, theFisher equation will be like this $1 + i = (1 + p) \times E(1 + \pi)$. To understand the relationship between money, inflation and interest rates, deposit rate it is important to have some basic knowledge about nominal interest rate and real interest rate. The nominal interest rate is the interest rate your bank offers to you. If you maintain a savings account in a bank, the nominal interest rate articulates you how much money will be given as profit in your account in certain time span. Chowdhury, E. Kalyan (2012) said the real interest rate will correct the nominal rate for the effect of inflation in order to tell you how fast the purchasing power of your savings account will rise over time. So, the estimation of the real interest rate is the nominal interest rate minus the expected inflation rate. So, Real interest rate = Nominal Interest Rate - Expected Inflation Rate and Nominal Interest Rate = Real interest Rate + Expected Inflation Rate.

Interest rate: An interest rate is the rate at which interest is paid by a borrower for the useof money borrow from a lender. Interest rates are normally expressed as a percentage rate over the period of one year.

Nominal interest rate: The rate of interest before adjustment for inflation. Suppose , you deposit Tk. 1000 with a bank for 1 year and receive interest of Tk.10. At the end of the year your bank balance is Tk. 110. In this case, the nominal interest rate is 10% per annum.

Real interest rate: This interest rate is the nominal interest rate minus the inflation rate as discuss above. It is a measure of cost to the borrower because it takes into account the fact that the value of money changes due to inflation over the course of the loan period. (Chowdhury, E. Kalyan (2012)

Inflation also has an important influence on funds or money originating from the public, one of which is in the form of savings at commercial banks, so that if there is an increase in inflation, monetary authority will issue a policy by adjusting the interest rate to overcome inflation. Inflation that occurs at a level that is too high which causes prices jumped sharply will be felt by all levels of society, especially in the middle to lower class income people of a country. A country will experience inflationary when investment spending increases in a state of low interest rates. Jaya, Herman Andi, et al. 2021 showed **p**eople or entrepreneurs are less interested in saving or saving their money in a bank, they are more likely to invest their money/capital, so that inflation has an effect on people's savings. We try to discuss here the relations or impact of inflation on lending rate and deposit rate of bank over the period of 1990 to 2021 in Bangladesh.

2. Literature Review

A lot of literature exists on determinants of inflation based on different techniques and time periods. Different sets of explanatory variables, growth, money supply, remittance, lending rate etc have been analyzed by the researchers. Hossain (1989), Nasim (1995), Khan and Qasim (1996) and Kemal (2006) estimated inflation as a monetary phenomenon. However, Hossain and Akhtar (1986), and Naqvi et al. (1994) related inflation to supply side bottlenecks, adjustment in government administered prices, exchange rate adjustments, escalation in indirect taxes and inflationary expectations. Many variables have been frequently taken by researchers to explain effect of inflation on lending rate and other deteminants. For instance Khan et al. (2007) have discussed exchange rate depreciation as a determinant of inflation. money supply has been discussed by Naqvi and Khan (1989), Hossain (1989), Nasim (1995), Khan and Qasim (1996), Khalid (2005), and Kemal (2006). Khalid (2005), Khan and Schimmelpfennig (2006) Hassan et al. (1995), Khan et al. (2007). Naqvi have found procurement and administered prices have positive pressure on inflation. Mujeri&Younus, (2009) , by using panel data of 48 Bangladeshi banks from period 2004 to 2008, analyzed the impact of Interest Rate Spread in the Banking sector in Bangladesh. They apply pooled OLS and fixed effect model for their study. The data set comes from bank's annual reports. Sakib et al., (2020) study about a panel data of 30 listed commercial bank in Bangladesh. By employing descriptive analysis, analysis of variance, linear regression analysis, multivariate analysis, multicollinearity test, correlation analysis, and Durbin-Watson test, their study aimed to identify the connection and effect of interest rate changes on banks' profitability

Khan et al. (2007), on the other hand, havetaken inflationary expectations to explain inflation. is discussed by Khalid (2005); Naqvi et al. (2006) and Khan et al. (2007) discussed about imported inflation. Credit expansion is discussed in explaining inflation by Khalid (2005), and Khan et al. (2007). By using a bivariate VAR, Khalid (2005) concluded that imported inflation, deficit-GDP ratio, money depth, exchange rate depreciation, openness and domestic credit were the important determinants of inflation. Khan et al. (2007) identified inflation expectations, private sector credit and imported inflation as the most significant explanatory factors. Agha and Khan (2006) have looked at the fiscal deficit and total bank borrowing by the government sector to explain inflation.

According to our knowledge, very few studies have included lending rate and deposit rate as indicators of inflation. We will use time series data set of 33 years to explain the above determinants of inflation taking a different set of variables and indicators of inflation as mentioned earlier.

Roubini 2022, showed effective disinflation requires both monetary and fiscal policy tightening. It should be done quickly to avoid building higher inflationary expectations and inertia and a stagflation scenario.

Inflation, which exceeds the central Bank and government target by a large margin, is no longer a hypothetical threat in most advanced economies; rather it is a real threat. It is a result of several past policy mistakes and adverse shocks experienced by the global and European economies since early 2020.

Landau, 2021; Borio, 2021; Weber, 2021 found that giving in to fiscal pressures would lead to even higher inflation and further undermine inflationary expectations

Asari *et al.* (2011) investigated the relationships between the Malaysian inflation rate, the interest rates and the exchange rates between the period 1999 to 2009 and found that an increase in interest rates would be effective in curbing exchange rate volatility and that there is a one-way causality relationship from interest rates to inflation and from inflation to exchange rates.

Amaefula, 2016 found that inflation rate increases the interest rate in the short term, studies for the long term show that the interest rate has an effect on inflation. The reason for this is the cost of capital, which is one of the production factors of interest rates. The fact that the interest rates are high for a long time increases the production costs and thus increases the inflation as explained.

3. Methodology

3.1 Data Collection

This present study uses secondary data from World Bank (WB) group, and ECIC data. The data cover time period from 1990 to 2022 of Bangladesh. The descriptive statistics includes mean, median, maximum and minimum values. The statistical analysis is performed with statistical software package STATA 14.0 version and Eviews 9 version.

3.2 Model Specification

Selection of an appropriate model in case of time series data is one of the most important tasks for time series analysis. This is because the inappropriate selected model gives not only wrong estimation but also biased result (Shrestha, and Bhatta, 2018). For time series data, Ordinary Least square (OLS) method can be used where all the variables are stationary at level or stationary at first difference or there is a mixture of both stationary and non-stationary variables. Since all the variables are stationary at first difference shown in table 3. For these characteristics of OLS model is used for this analysis.

4. Analysis and Findings

4.1 Descriptive statistics

Fisher and Marshall, 2009; Kaur et al., 2018 said descriptive statistics is an important initial stage of summarizing, organizing, presenting and analyzing the status of variables in a sample or population before making any inferential statistics of a research. It contains type of data, measures of frequency, central tendency and variation The below table 1 shows the descriptive statistics of this present study which includes mean, standard deviation, maximum and minimum values of the variables as well as their corresponding skewness and kurtosis.

Table 1: Descriptive Statistics

	Inflation	Deposit_Rate	Lending_Rate
Mean	6.138182	8.156818	12.03939
Median	6.100000	7.810000	12.82000
Maximum	11.39000	13.66000	14.84000
Minimum	2.000000	5.050000	7.210000
Std. Dev.	2.189454	2.233846	1.992059
Skewness	0.112545	0.893385	-0.991503
Kurtosis	3.063690	3.291104	3.154818
Observations	33	33	33

The mean value of inflation rate is 6.138182, standard deviation is 2.189454 minimum value is 2.000000 and maximum value is 11.39000. Skewness is closer to zero. Similarly, mean value of deposit rate is 8.156818, standard deviation is 2.233846, minimum value is 5.050000 and maximum value is 13.66000. Skewness is closer zero and may said data is belong to normal distribution. Finally the mean value of lending rate is 12.03939, standard deviation is 1.992059, minimum value is 7.210000 and maximum value is 14.84000 Skewness is -0.991503

Table 2: Corelation matrix

Variables	Inflation	Deposit_Rate	Lending_Rate
Inflation	1.000000	-0.134767	-0.042581
Deposit_Rate	-0.134767	1.000000	0.781951
Lending_Rate	-0.042581	0.781951	1.000000

Correlation matrix using STATA 14

	Inflat~n	Lendin~e	Deposi~e
Inflation	1.0000		
Lendingrate	-0.0426	1.0000	
Depositrate	-0.1348	0.7820	1.0000

Table 2 shows the correlation matrix among the variables presented in the proposed model. The correlation between inflation rate and the lending rate is negative indicated by -0.0426 whereas correlation between inflation rate and deposit rate is also negative shown by -0.1348, correlation between deposit rate and lending rate is positive shown by 0.7820.
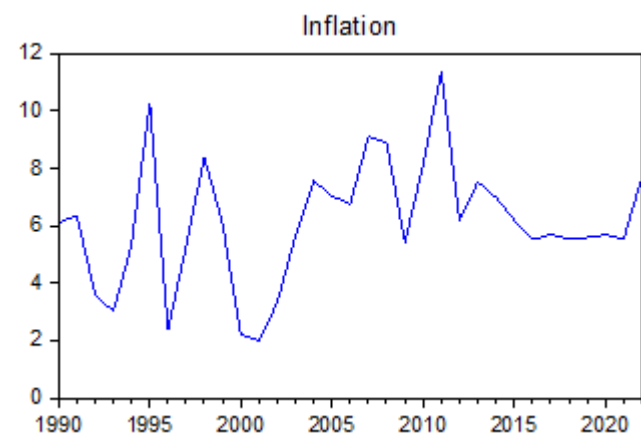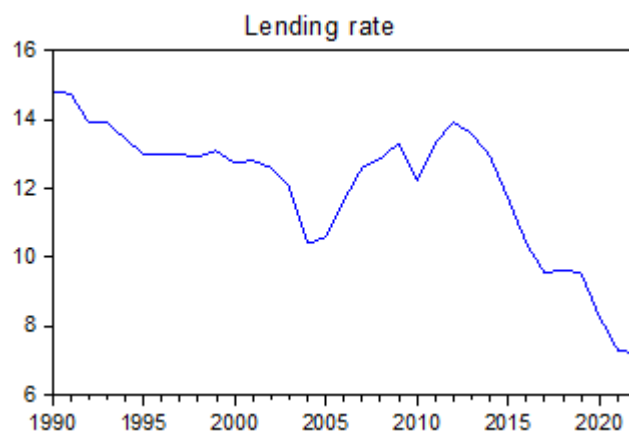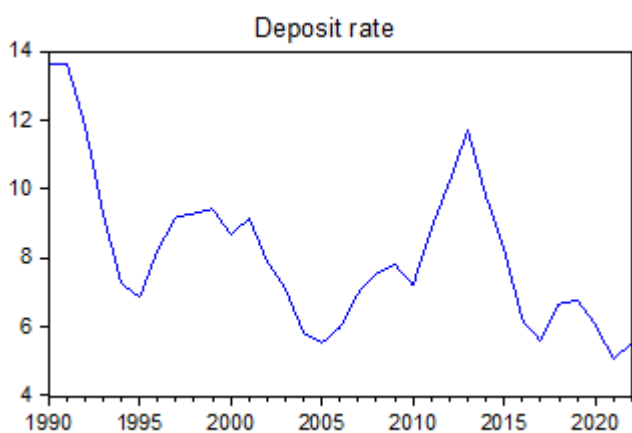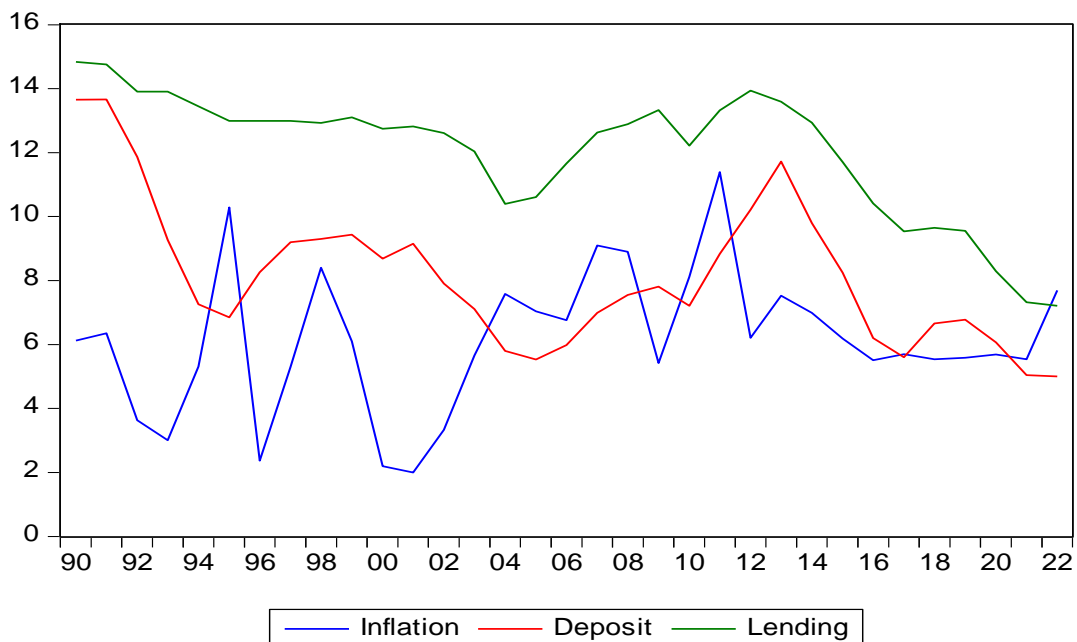
4.2 Unit Root Test

The stationary properties of the variables have been checked by using Augmented Dickey-Fuller (ADF) unit test to conduct the test for co-integration and causality. Here unit root test is applied at level and at first difference to identify the order of integration of the time series. The empirical results of the ADF unit root test given on table -3 below.

At level			1st difference		
Variables	T statistic (constant & trend)	Hypothesis (Results)	Variables	T statistic (constant & trend)	Hypothesis (Results)
Inflation	-4.243472	Not stationary	Inflation	-7.340074	Stationary
Deposit Rate	-2.824359	Not Stationary	Deposit Rate	-5.107203	Stationary
Lending rate	-1.767584	Not stationary	Lending rate	-3.928222	Stationary

Table 3 reveals that the variables included in the proposed model are found stationary at first difference. The null hypothesis is time series data is stationery at level. However, this null hypothesis is rejected by all the variables included in the model i.e. inflation, interest, deposit rate are tested with first difference. Test of co-integration need to run because of being all the variables stationary at first difference. The Ordinary Least Square (OLS) model has been used for time series analysis.

Graph of at level of data

4.3 Estimate of Equation

The test results given on the table reveals that the hypothesis of unit root test cannot be rejected in all variables used herewith at levels. But at first differences, the hypothesis of unit root test indicates that all variables are rejected at 0.05 level of significant meaning that variables are integrated of degree one, I(1). This kind of results mean all variables become stationary only after first difference. The estimate of equation done by direct OLS (ordinary least square) method gives the following results:

Dependent Variable: INFLATION
Method: Least Squares
Sample: 1990 2022
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEPOSIT_RATE	-0.255959	0.282983	-0.904504	0.3729
LENDING_RATE	0.177640	0.317330	0.559794	0.5798
C	6.087321	2.506617	2.428500	0.0214

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R-squared	0.028312	Mean dependent var	6.138182
Adjusted R-squared	-0.036467	S.D. dependent var	2.189454
S.E. of regression	2.229018	Akaike info criterion	4.527508
Sum squared resid	149.0557	Schwarz criterion	4.663554
Log likelihood	-71.70387	Hannan-Quinn criter.	4.573283
F-statistic	0.437054	Durbin-Watson stat	1.483363
Prob(F-statistic)	0.649984		

As per Eviews 9 test

Source	SS	df	MS		Number of obs	=	33
					F(2, 30)	=	0.44
Model	4.34302018	2	2.17151009		Prob > F	=	0.6500
Residual	149.055671	30	4.96852236		R-squared	=	0.0283
					Adj R-squared	=	-0.0365
Total	153.398691	32	4.79370909		Root MSE	=	2.229

Inflation	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Depositrate	-.2559591	.282983	-0.90	0.373	-.8338874	.3219692
Lendingrate	.1776395	.3173301	0.56	0.580	-.4704351	.8257142
_cons	6.087321	2.506617	2.43	0.021	.9681258	11.20652

As per test by STATA 14

The findings of the estimated equation reveal that lending rate, is directly related to the price level of Bangladesh at the time span of 1990 to 2022. The coefficient having positive sign is significant suggesting that 1(one) percent increase in lending rate leads to 0.177640 percent tailoring inflation or consumer price index on average in the long run span. Deposit rate has found a negative effect on inflation from this study. As economy of the country grows, consumers and businesses used to spend more money on goods and services creating demand on markets lead to raise the price of the products and services. As a result, rate of the inflation raises. Mujumder (2016) found a statistically significant long run positive relationship between inflation rate and economic growth of GDP. Behera(2014), Hussain(2011) Chowdury(2001) and Mahmoud(2015) also found a positive relationship between inflation and economic growth in long run. As per test results, consumer price index (CPI) or inflation will controlled by 0.177 percent due to 1 percent increase in lending rate on an average in long run.Normally, by increasing lending rate, government can ruin inflation for long run. Because if lending rate in a country is going high,businesses will be reluctant for taking money from banks due high cost of money that is ultimately effect on taming inflation. When inflation hits the economy and banks give high interest rate on deposit they collected, money supply may increase in markets. The results we found from the two test –one by Eviews and another- by STATA 14 show negative relationship between deposit rate and inflation. So, Inflation and deposit interest rate have inverse relation in long run, we can say from the test result found.

This test may support the case of relationship between inflation and deposit interest rate. Though very light effect of deposit interest rate on inflation is seen from the resultobtained. It is remember that this study is conducted for limited period of time from 1990 to 2022 considering effect of only two factors lending rate and deposit rate on inflation. To extract accurate result, more variables must be examined in this regard. However, to find out co-integration among the variables we conducted Johanson co-integration test. Co-integration result given below

Johanson co-integration Results

The results of data stationary test are found that inflation, Deposit rate, exhibit stationary at first difference level. We can said data to be stationary if the calculated value of the ADF is found greater than the critical value of the ADF table at a significant level of 0.05. As all variables found stationary at 1st difference level, in order to determine relationship between the stationary series, it is necessary to find out whether there is a co-integration relationship existed or not between the series in long run or short run basis. Before applying the co-integration test, lag length was determined by using VAR model. The optimal lag length for the series determined as 8. The existence of long run relationship between the series was investigated by using the co-integration method of Johanson Co-integration test. Johanson co-integration test results are given in table 2 below.

Sample (adjusted): 1992 2022
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: INFLATION DEPOSIT_RATE LENDING_RATE
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.536007	38.97094	29.79707	0.0033
At most 1	0.384341	15.16645	15.49471	0.0560
At most 2	0.004170	0.129534	3.841466	0.7189

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.536007	23.80448	21.13162	0.0205
At most 1 *	0.384341	15.03692	14.26460	0.0377
At most 2	0.004170	0.129534	3.841466	0.7189

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In the result we see that there is 1 (one) co-integration vector in trace and two co-integration vectors found in maximum eigenvalue test. As a result of comparison of maximum eigenvalue and trace statistics show 2 con-integration vectors with 5% significance level, it may be possible to say that long term equilibrium relationship between variables is valid during the analytical period. However, more study is needed in this purpose to find out exact co-integration.

5. Conclusion

This present study captures the effect of only two variables namely lending rate, deposit rate or interest rate on the inflation rate. For this analysis data 32years have been considered. The results find that two variables have some effect on the inflation rate on average. Lending rate is directly related to control inflation. It estimates that increase in the lending rate will influence to controlinflation. On the other hand, to control money supply in the market during high inflationary situation, lowering deposit rate might play a significant role for long run on average. However, this study is limited to 1990- 2022. Another limitation of this study is that it did not consider the fiscal and monetary policy of the government of Bangladesh which has great impact on the inflation rate. Thus, this study can further enrich by considering more data with wider variables. This can also be done with more geographical areas such as Asian countries and particularly Indian sub-continent. Further study is needed to reach on concrete decision by taking into consideration of middle-income countries, low-income countries and high-income countries etc. This study provides some relationship data about the impact of lending rate and Deposit rate or interest rate on inflation during the period from 1990 to 2022. This study also recommends that more suitable policies regarding maintaining of interest rate and deposit rate to control inflation of the country. This study found that increasing interest rate is an effective tool to control inflation. This study also found that lowering deposit rate or interest rate may control inflation to some extent in long run on an average. However, further research is needed (FRIN) for more investigations about the effect of lending rate and deposit rate on inflation.

Tables

Year	Inflation	Lending rate	Deposit rate
1990	6.12	14.84	13.65
1991	6.35	14.76	13.66
1992	3.63	13.91	11.86
1993	3.01	13.91	9.27
1994	5.31	13.45	7.26
1995	10.29	12.99	6.85
1996	2.37	12.99	8.26
1997	5.30	12.99	9.2
1998	8.40	12.93	9.3
1999	6.10	13.1	9.43
2000	2.20	12.75	8.68
2001	2.00	12.82	9.15
2002	3.33	12.61	7.9
2003	5.66	12.04	7.11
2004	7.58	10.4	5.8

2005	7.04	10.61	5.53
2006	6.76	11.66	5.985
2007	9.10	12.63	6.99
2008	8.90	12.89	7.55
2009	5.42	13.33	7.81
2010	8.12	12.22	7.21
2011	11.39	13.32	8.84
2012	6.21	13.94	10.21
2013	7.53	13.59	11.72
2014	6.99	12.94	9.8
2015	6.19	11.71	8.24
2016	5.51	10.41	6.2
2017	5.70	9.54	5.6
2018	5.54	9.65	6.66
2019	5.59	9.55	6.78
2020	5.69	8.29	6.07
2021	5.54	7.32	5.05
2022	7.69	7.21	5.55

Source: World Bank

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