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Impact Assessment of Interest Rate Caps and Potential Policy Options: Bangladesh Perspective

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Impact Assessment of Interest Rate Caps and Potential Policy Options: Bangladesh Perspective

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Abstract

The objective of this study is to examine the current status of the lending and deposit rates after imposing cap of 9 percent on the lending rates and 6 percent on the deposits rates with effective from April 1, 2020 and its impact on the macro and bank specific variables. A host of scrutiny methods are used to identify the relationship between the lending rate and other macroeconomic and bank specific variables such as investment, private sector credit, non-performing loans, policy rate, deposits rate, NSD certificate rates, inflation, GDP, return on assets (ROA) and return on equity (ROE) etc. Empirical results using ARDL and OLS methods and Graphs and Tables show that there is an inverse relationship between the real private investments and the real lending rate. The profitability measures in terms of ROA and ROE shows no sign of deceleration of profits after reduction of loan rate, rather it increased. The deposit rate turns out to the strongest determinants of all banks though varies within the groups. The relationships with the non-performing loans are also significant and positive.

Finally, policy implications of this study would be although the interest rate cap is against the market economy concept but to increase economic activity, Bangladesh Government together with the Central Bank came forward and put pressure on the banking community to lower the whole term structure of the interest rates by imposing restrictions on the interest rates. Bangladesh experience shows that although banks are charging lower interest rate they are enjoying profits at the cost of lower deposits rate of the savers. The non-performing loans also came down compared with the earlier periods. The study finds that recent lower lending rate through interest rate cap has been a blessing for the industry sector receiving lion shares (nearly 60 percent) of total private sector credit disbursement by the scheduled banks while shares to the agriculture, CMSME and others have suffered a slight setback.

However, there is a concern on inflation showing uptrend. This may call for lifting up cap on the interest rates. The central bank also needs to be careful regarding the quality of loans. Evidence shows that the interest rate on the large industries are lower than the agriculture and the CMSME which raise concern that imposing cap may be benefiting rich more than the small and medium borrowers. The impact on the interest rate restrictions on the borrowers may be asymmetric. That will hamper the broad objectives of the interest rate cap. Therefore, the central bank needs to be vigilant not only the quality of the loans but also on the quality of the borrowers.

[1] The authors of this paper are respectively Executive Director, Director and Joint Director, Research Department of Bangladesh Bank. The views expressed in this paper are authors' own and do not necessarily reflect the views of Bangladesh Bank.

Impact Assessment of Interest Rate Caps and Potential Policy Options: Bangladesh Perspective

Interest rate caps and floors are generally used by many central banks around the world[2] as regulatory measures for protecting borrowers and savers from an adverse situation caused by unusual movements of the rate. Sometimes governments of developing countries utilize interest rate ceilings for political and economic purposes, most typically to assist a specific industry or sector of an economy. The governments might have discovered a market failure in an industry or may have the intention to spend more financial resources on that sector than the market would dictate. Central banks sometimes may also impose a floor limit of interest rate on deposits it deems necessary to protect the interest of the savers' for resisting the trend of their losing money due to negative real return.

In Bangladesh, private entrepreneurs had a long-standing demand for lowering the interest rate for reducing the cost of doing business. High lending rates have been considered one of the most influential deterrents to the business expansion of local entrepreneurs, especially since the advancement of globalization in the late 1990s. High interest on loans and advances was also being considered one of the root causes of soaring non-performing loans (NPLs) in the banking system. Following a series of discussions, at one stage the Bangladesh Association of Banks (BAB)[3]deliberately came forward and agreed to maintain an interest rate ceiling of 9 percent on lending and 6 percent on deposit. A few numbers of banks willfully started to comply with the decision to lower the lending rate ceiling to 9 percent while most of the banks procrastinated to execute it by themselves which created an untenable situation in the banking industry. Meanwhile, COVID-19 badly struck on the Bangladesh economy which induced Bangladesh Bank to adopt an expansionary monetary policy to contain pandemic-related disruptions. Against this backdrop, the Bangladesh Bank endorsed it as a regulatory measure on April 01, 2020, for ensuring the lending rate maximum at 9 percent for scheduled banks in all sectors except credit cards and also dictated that the interest rate cap on short-term deposits will be at 6 percent for all banks. Banks were then found to implement the regulatory measure through misappropriation and depriving the depositors of highly negative real return on deposit which compelled Bangladesh Bank to issue another circular on August 08, 2021, instructing banks to set their short-term deposit rates not lower than the prior 3 months' average official inflation rate. Later on, considering the higher fund management costs of the non-bank financial institutions (NBFIs), Bangladesh Bank instructed them to maintain the interest rate ceiling for their lending activities at 11 percent and 7 percent for the deposits which become effective on July 01, 2022.

Meanwhile, both the domestic and global macroeconomic scenarios have dramatically changed especially after the Russian invasion of Ukraine on February 24, 2022. Although

[2] The World Bank Group publication on 'Interest Rate Caps around the World: Still Popular, but a blunt Instrument' indicates that at least 76 countries around the world were found to use some forms of interest rate caps on loans in 2014.
[3] The trade body of private banks represents the interest of the banking industry in Bangladesh.

real GDP growth of the global economy was on a hasty recovery mood from the COVID-19 pandemic related torments until 2021 supported by hefty stimulus packages, the Russia-Ukraine War and trade tussles among global giant economies have now totally turned around the global macroeconomic scenario in the recent months. Globally food, fuel and all other commodity prices have tremendously increased owing to the supply chain disruptions grounded by the Russia-Ukraine war and trade tussles. The central banks around the world including the US Fed have already raised their policy rates to such a high level that it is now putting immense pressure on the currencies of emerging markets and developing economies of the world.

The spillover effect of the globally high commodity price has already created some undesirable shade on the Bangladesh economy reflected with historically high current account deficit and a sharp depreciation of the Taka alongside a rising trend of inflation, though overall domestic inflation still remained at a reasonable level as compared to various advanced and developing countries of the world. However, due to the recent fuel price hike and a sharp depreciation of BDT against the USD, many economists and researchers are now apprehending further provocation of inflation in the coming months and are suggesting withdrawing interest caps to strengthen the monetary policy transmission mechanism for checking potential inflationary pressure. Under such circumstances, this paper is an attempt for assessing the impacts of existing interest caps on our macro economy and suggesting possible policy recommendations.

2. Common Merits and Demerits of Interest Rate Caps

Usually, there are some pros and cons of the interest rate cap. The most common benefits generally expected from an interest cap are: (i) it protects the borrowers and investors from excessive shocks of an interest rate and as such it makes their business operations easy; (ii) it lowers the cost of funds and increases the access of finance to business entrepreneurs; (iii) it fosters economic growth and employment due to increase of investment; and (iv) it protects consumers from exorbitant commodity price hike due to investment induced ample production of goods and services. On the other hand, the most striking demerits of the interest rate cap are: (i) it lowers the credit supply for the CMSME sectors where the administrative cost of credit management is higher than in large industries; (ii) it reduces the speed of branch expansion by banks and financial institutions due to adverse impact on profitability in retail banking/financing; (iii) the depositors suffers from low-interest rate; (iv) people fell discourages to keep deposit at banks/FIs; (v) informal credit market and long-term assets market stimulates due to diversion of deposit from the banks and FIs; and (vi) Finally, fixing interest rate is not a right approach as it affects market mechanism and restrains effectiveness of the central bank's monetary policy for discharging its role of controlling inflation.

3. Global Experiences of Using Interest Rate Caps

Although the idea behind putting restrictions on interest rates is straightforward, there is a great deal of variety in the ways in which governments put such limits into effect. While some nations have implemented a standard interest rate cap that is incorporated into all of the legislation for registered financial institutions, other nations have tried to take a more flexible approach.

The most simple interest rate control puts an upper limit on any loans from formal institutions. This might simply say that no financial institution may issue a loan at a rate greater than, say, 40 percent interest per annum, or 3 percent per month. However, it has been determined by the governments of a great number of nations that it is preferable to discriminate between different kinds of loans and set specific limitations based on the customer and the type of loan rather than to establish a single, universally applicable limit on the interest rate that can be charged on loans. The reasoning behind a cap that is flexible is that it can take effect at different levels of the market, thereby reducing the amount of consumer surplus.

When the central bank is determining monetary policy, the interest rate cap is frequently tied to the base rate that it establishes. This makes the measure more flexible. This indicates that the cap adjusts itself in accordance with the conditions of the market (rises with monetary tightening, falls with easing). This is the model that is employed in Zambia[4], where banks are able to lend at nine percentage points above the policy rate and the price of microfinance lending is priced as a multiple of this policy rate. In several other countries, the lending rate is tied to the deposit rate, and governments have limited the interest rate spread that banks and deposit-taking MFIs are allowed to charge between the borrowing rate and the lending rate. Because some banks try to get around lending limitations by increasing arrangement fees and other costs for the borrower, governments frequently try to limit the overall amount of the loan. This is because some banks try to get around lending caps by increasing arrangement fees.

Other nations' governments have made attempts to establish varying caps according to the type of lending instrument being used. For instance, the National Credit Act of 2005 in South Africa categorized eight different sub-categories of loans, each of which had a different maximum interest rate that was established by law.

Interest rate capping structure used in South Africa in 2005

Sub sector	**Maximum prescribed interest rate**	
Mortgages	(RRx2.2)+5%	per annum
Credit facilities	(RRx2.2)+10%	per annum
Unsecured credit transactions	(RRx2.2)+20%	per annum
Developmental credit agreements		
- for the development of a small business	(RRx2.2)+20%	per annum
- for low income housing (unsecured)	(RRx2.2)+20%	per annum
Short term transactions	5%	per month
Other credit agreements	(RRx2.2)+10%	per annum
Incidental credit agreements	2%	per month

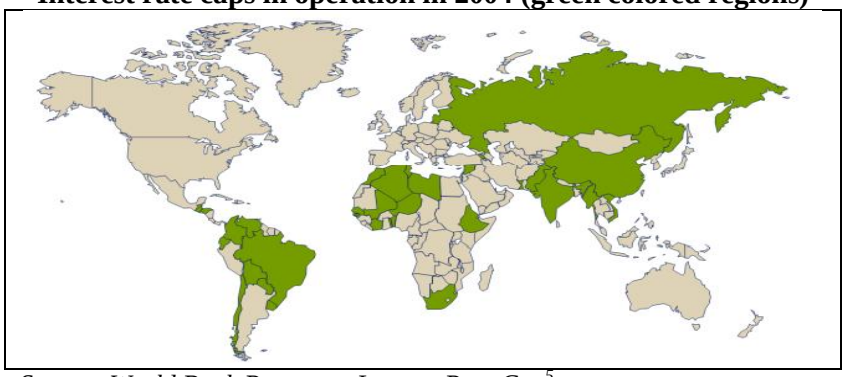
* RR= Central Bank Repo Rate Source: South Africa National Credit Act (2005)

[4] Bank of Zambia press release, available here http://www.boz.zm/publishing/Speeches/Press%20Release%20on%20Interest%20Rates.pdf

A significant number of nations, including many rich nations like France, Germany, and the United States, have recently begun to implement some type of maximum level of interest rates. These nations are among the growing number of nations that utilize such a measure. Since the beginning of the financial crisis and the expansion of payday loan companies, there has been a rise in the number of states that have enacted regulations that place limitations on interest rates. These caps primarily target loan sharks and predatory lending practices. There is a fascinating and growing body of literature on this subject; however, for the purpose of this study, we will concentrate on developing countries because there are more applicable lessons to be gained regarding interest rate regulations in these locations.

Equally, because there are a variety of ways that nations can adopt some type of interest cap, which were discussed above, it is impossible to construct a comprehensive list of who is capping interest rates and who is not. Many nations are utilizing or have previously utilized some type of a cap in order to direct resources toward a certain sector or industry. Many of these caps are short-term measures, and it would be very difficult to catalog any or all of them. For this reason, we present a list of interest rate ceilings in emerging or developing countries that were compiled by the World Bank in 2004, and then we concentrate our attention on a variety of case studies.

Interest rate caps in operation in 2004 (green colored regions)



Source: World Bank Report on Interest Rate Cap[5]

Following the tide of financial liberalization that occurred in the 1990s, the first decade of the 21st century witnessed a general trend toward increasing government control over financial sectors. This occurred in the wake of the wave of financial liberalization during the 1990s. This was especially the case for the nations located in Latin America, many of which had, during the course of the preceding decade, instituted a variety of interest rate regulations in order to maintain economic stability. Over the course of the previous decade, a number of nations, including Chile, Bolivia, Colombia, Peru, Uruguay, Venezuela, Nicaragua, Guatemala, Ecuador, and Brazil, tried their hands at regulating their interest rates in one way or another.

[5] Helms, Brigit and Reille, Xavier, Interest Rate Ceilings and Microfinance: The Story So Far (September 2004) CGAP Occasional Paper no. 9

In recent years, a number of nations in North Africa have implemented interest rate caps, with Morocco, Tunisia, Algeria, Libya, and Egypt being the primary nations to do so in the microfinance industry. In this part of the world, the ceilings are normally between 3 and 5 percent per month. In the past, the member states of the organization formerly known as 'West African Economic and Monetary Union (WAEMU)' agreed to cap the annual interest rate on microloans at 27 percent. An interest rate cap was put into effect in India in 2011, and it supports rural households with annual incomes of up to 60,000 rupees, as well as urban and semi-urban households with incomes of up to 120,000 rupees. The margin cap is set at 12 percent, and the interest rate cap on microloans is set at 26 percent per annum. Both of these caps apply to microloans.

The civil law of Thailand places a cap on the annual percentage rate of interest that can be charged by unofficial financial organizations on loans made by those entities. The central bank, on the other hand, imposed a cap of 28 percent on the total interest and service charges that may be applied to any personal consumer loan and a cap of 20 percent on the interest rate that could be applied to credit card loans. The maximum annual percentage rate that microfinance lenders are allowed to charge was regulated at 36 percent in 2013 by the Ministry of Finance. Microfinance and bank lending in Myanmar are both subject to interest rate limits. In 2011, Myanmar passed a new law that set the maximum interest rate for microloans at 2.5 percent per month, which is equivalent to 30 percent per year. In addition, Myanmar's central bank put limits on the amount of money that commercial banks could lend out; these limits were reduced to 13 percent per year in 2012, while the Myanmar Agriculture Development Bank was given a limit of 8.5 percent per year on the amount of money it could lend out. An arrangement that was put into place after the Asian crisis, known as a "gentleman's agreement," places a ceiling on the interest rate that a bank can charge its customers at 5% more than the rate at which the 91-day Treasury bill can be purchased on the secondary market. The usury regulation that had been in place since 1916 was repealed by the central bank in 1981 and the only rate caps that remained were on short-term lending rates. In 1983, all rates were deregulated in accordance with market-oriented principles.

4. Brief Literature Review on Interest Rate Capping

There are empirical evidences for several nations regarding the effects of interest rate caps on loan rates. Although the majority of research found that the consequences were mostly unfavorable, there were a handful that found that there were some good outcomes; this was the situation in the United States. However, there are currently no results available regarding the positive effects that the caps will have on other countries, and it is too early to draw any specific conclusions about interest rate caps.

There was a lack of clarity regarding the overall cost of credit since several financial institutions in South Africa circumvented caps on interest rates by charging for credit life insurance and other services. The imposition of interest rate caps on microfinance loans in 'West African Economic and Monetary Union (WAEMU)' countries caused microfinance

institutions to withdraw from poorer and more remote areas, as well as increase the average loan size, in order to improve efficiency and returns. This was due to the fact that the interest rate ceiling was considered to be too low (Helms and Reille 2004). As a result of Japan's interest rate caps being lowered, the supply of credit appeared to decrease, the acceptance rate for loan applications dropped, and the number of people engaging in illicit lending increased (Ellison and Forster 2006; Porteous, Collins, and Abrams 2010).

Because there was a lack of consensus in Armenia about the methodology for determining the interest rate, banks and microfinance institutions were forced to levy fees and commissions in order to circumvent the rate cap and provide less transparency to their clientele (Helms and Reille 2004). Both access to credit and welfare were hindered as a result of interest rate controls in Poland. According to the research of Ellison and Forster (2006), interest rate ceilings in France and Germany led to a reduction in the variety of financial products available to low-income households. In France, lenders have turned to revolving credit as a means of approaching homes with lower incomes. In Germany, however, many borrowers with low incomes and high risk profiles are denied access to credit.

According to the research carried out by Capera, Murcia, and Estrada (2011), throughout the time period of 1980–2008, stringent controls on interest rates were found to have a negative correlation with financial depth in 18 nations across Latin America. In Nicaragua, for example, the imposition of a cap on interest rates drove microfinance institutions to cut back on lending, which in turn prompted a number of these institutions to leave rural regions due to the high operational expenses and dangers involved in doing business there. They also responded by increasing the fees and other charges that they required customers to pay in order to cover their expenditures, as these were not capped (Helms and Reille 2004). In the case of Colombia, Delgado (2004) discovered that interest rate limits had a severe impact on small businesses due to the higher transaction costs associated with those businesses; more recently, the relaxation of caps was one of the reasons behind the increase in the volume of microcredit lending (Porteous, Collins, and Abrams 2010). The imposition of a maximum interest rate in Bolivia in the year 2004 resulted to a reduction in the number of new lending institutions that were granted licenses (Miller 2013).

The impact of loan limits in the United States has been the subject of research from a number of different studies. Laeven (2003) discovered that financial liberalization policies, such as the elimination of interest cap limits, have positively benefited the access to financing that small businesses have, but Ellison and Forster (2006) observed a migration of clients to jurisdictions with less restrictive lending. Another study, this one focusing on New York in the middle of the 19th century, came to the conclusion that interest rate limitations increased both the amount of unlawful lending that took place as well as the average size of the loans (Bodenhorn 2007). Other research carried out in the United States came to the conclusion that although there is an increase in the availability of credit for high-risk borrowers when interest rate caps are raised, there is also an increase in the likelihood of default due to the high cost of borrowing. In addition, although the imposition of caps in the credit union sector resulted in a reduction in interest rates, this resulted in a reduction in the amount of credit available (iff/ZEW, 2010).

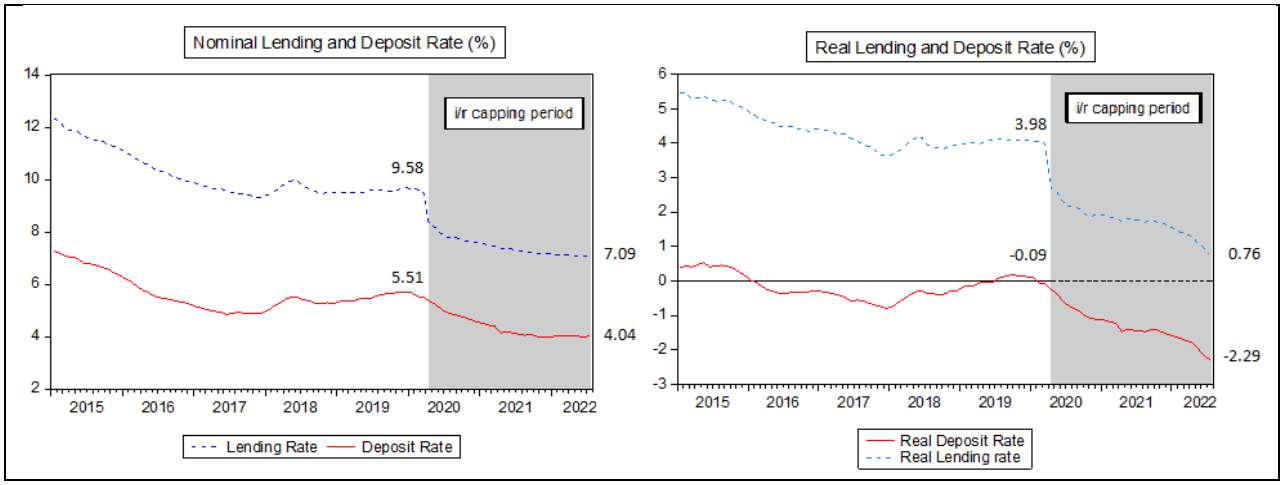
5. Evaluation of Impact of Interest Rate Caps on Different Monetary and Credit Variables in Bangladesh

5.1 Weighted Average Lending and Deposit Rates

5.1.1 Evaluation of a Long Run Trend during 2015-July 2022

Both the nominal and real lending and deposit rates, spanning from January 2015 to July 2022, are shown in Graph 1. It shows that the imposition of interest rate capping, on April 2020, has pull-down both the lending and deposit rates below their period average during 2015-2022 (up to July) both in nominal and real terms which is consistent with the interest rate liberalization efforts.

Graph 1: Weighted Average Lending and Deposit Interest Rates (in both Nominal and Real Terms)

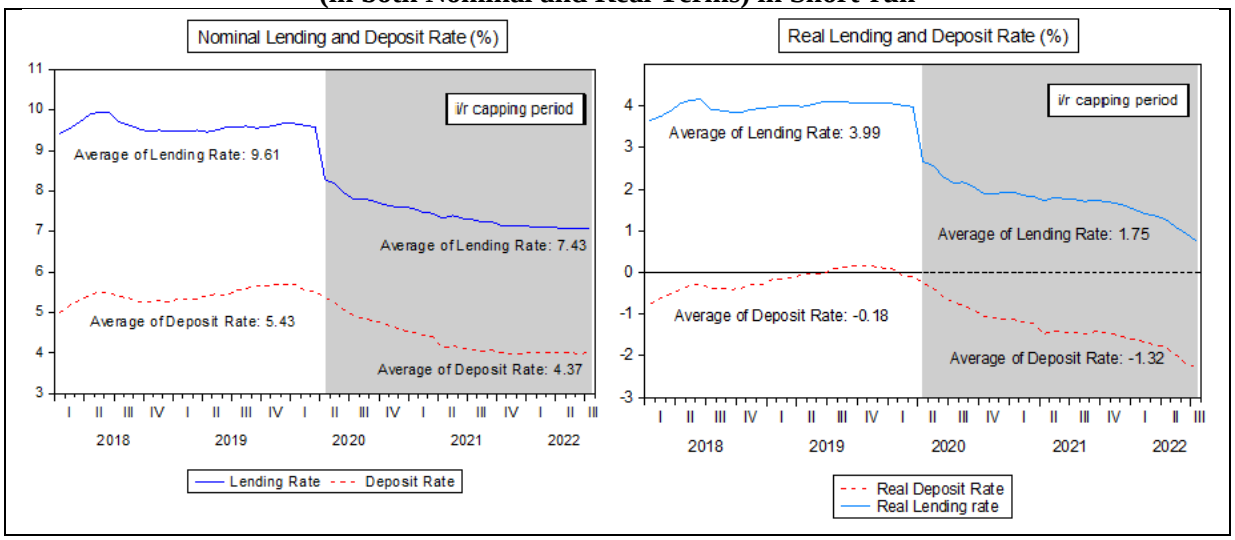


Source: Statistics Department, Bangladesh Bank and Authors' Calculation. Note: i/r means interest rate

5.1.2 A Short-run Comparison between Non-Capping and Capping Periods (2018-2022 up to July)

Both the nominal and real lending and deposit rates, spanning from January 2018 to July 2022, are shown in Graph 2. To compare the periods before and after the imposition of the interest rate cap, an equal number of monthly data have been compared. It shows that even if we compare a similar number of months before and after the imposition of interest rate caps, both the lending and deposit rates have sharply declined in nominal and real terms. It is notable that the average deposits rate in real terms remained negative both prior to and after the imposition of caps, though depositors' suffering from the negative return has significantly increased after the imposition of caps.

Graph 2: Weighted Average Lending and Deposit Interest Rates (in both Nominal and Real Terms) in Short-run



Source: Statistics Department, Bangladesh Bank and Authors' Calculation. Note: i/r means interest rate

5.2 Weighted Average Deposit Rate and Deposit Growth

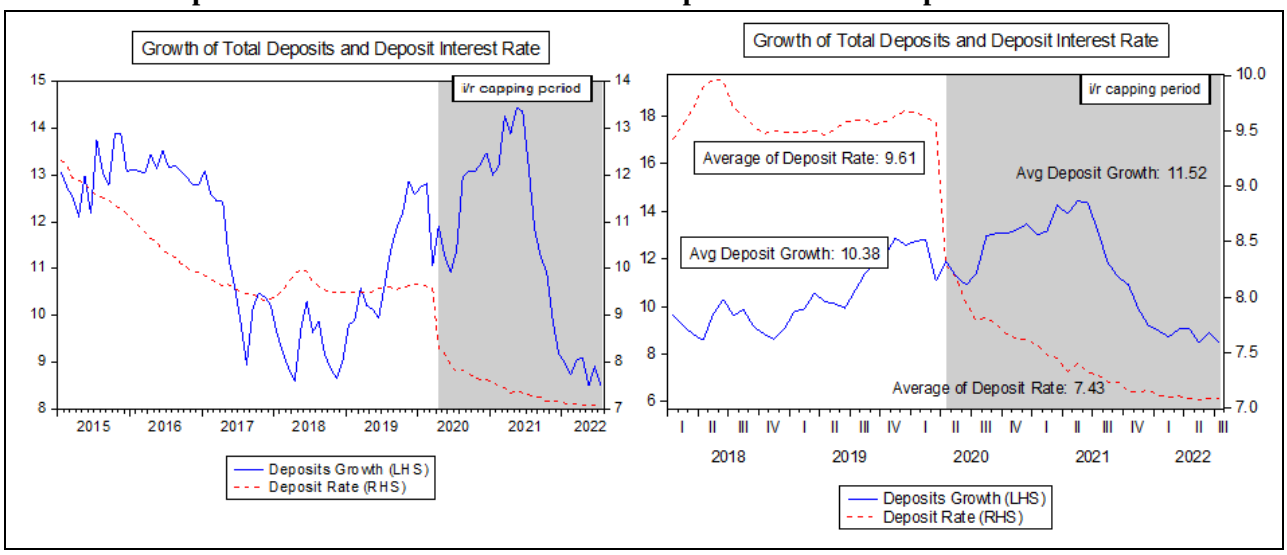
5.2.1 Evaluation of a Long Run Trend during 2015-July 2022

Monthly data plotted from 2015-2022 (up to July) regarding y-o-y growth of total deposits and weighted average interest rate on deposits suggest that there is no straightforward relationship between them, though a further longer span of time series data set is supposed to provide an inverse relationship between these two variables. In fact, deposit growth does not lonely depend on the interest rate. When the real income of the households and overall BoP enjoy a surplus situation due mainly to an increase in wage earners' remittances and current account surplus, deposits also follow an up-surging trend in Bangladesh.

5.2.2 Comparison of Trends between Non-Capping and Capping Periods (2018-2022 up to July)

Graph 3 compares the monthly movements of deposit growth and the weighted average interest rate on deposits. It is observed that during the non-capping period average interest rate on deposits was significantly higher (9.61 percent) than that of the capping period (7.43 percent). But the average growth of deposits during the non-capping period was lower (10.38 percent) than that of the capping period (11.52 percent), implying that interest rate is not the only factor for the deposit growth during the period mentioned above.

Graph 3: The Trend in Growth of Total Deposits and W.A. Deposit Interest rate

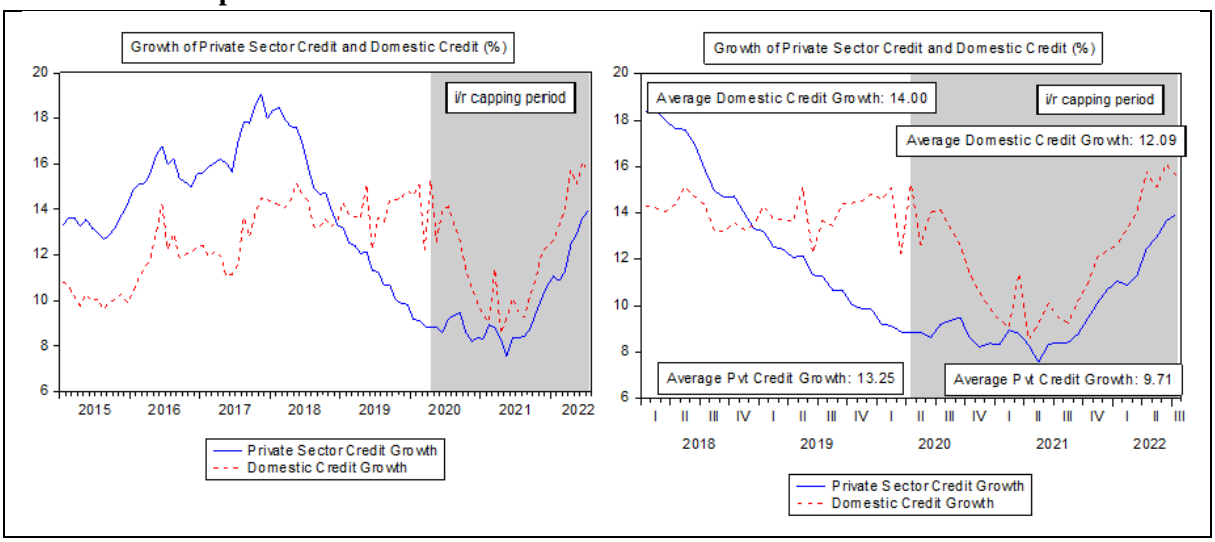


Source: Statistics Department, Bangladesh Bank and Authors' Calculation. Note: i/r means interest rate

5.3 Growth of Domestic Credit and Credit to the Private Sector

The quicker recovery of economic activity as a result of the relaxation of COVID-related restrictions appears to have contributed to the upward trend in private sector credit growth in recent months. Available information suggests that monthly average growth of domestic credit including credit to the private sector was higher during the non-capping period than the interest rate capping period due to the pandemic situation of COVID-19 (Graph 4). However, a notable feature is that when the deposit growth is coming down from the middle of 2021 then both the domestic and private sector credit growths are sharply increasing which is generating liquidity pressure in the money market. As a result, the interbank call money rate and yields of the government treasury bills and bonds have significantly increased in recent months.

Graph 4: The Trend in Growth of Domestic and Private Sector Credit



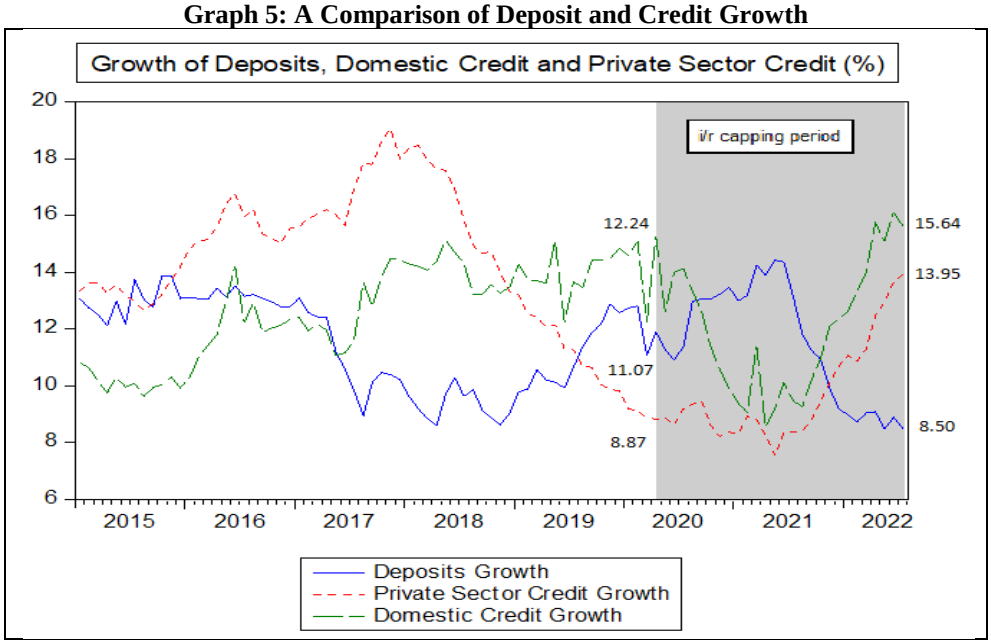
Source: Statistics Department, Bangladesh Bank and Authors' Calculation. Note: i/r means interest rate

The dwindling growth of deposit against the sharply rising trend of both the domestic and the private sector credit growth are creating a liquidity pressure on the banking system, though with various recent measures undertaken by the government and Bangladesh Bank to contain import payments and some austerity measures taken both in the domestic and external sectors are anticipated to be helpful in bringing down this liquidity pressure in coming months.

5.4 An Opposite Movement of Deposit and Credit Growth: Demand Supply Approach

As per the economic theory, the demand for credit to the borrowers is inversely related to banks' lending rates. The supply of funds for banks' credit disbursement on the other hand is positively related to the interest rate on deposits. This means, at a lower interest rate, borrowers' demand for loans and advances increases at a faster pace while the supply of funds for banks' credit disbursement slowed down due to sluggish growth of deposits owing to the low level of interest rate[6]. Available information suggests that even after the imposition of an interest rate cap on lending, the credit demand was exceedingly slow due to the disruption of economic activities from the pandemic situation of COVID-19. However, with the gradual improvement of the pandemic situation, credit demand as reflected through the growth of credit to the private sector in particular started to significantly increase especially from the last quarter of 2021 while the supply of banks' funds for credit gradually decreased due to slow growth of deposit owing from the low-interest rate on deposits[7] which is also comprehensible from the recent reduction of surplus cash (excess over CRR) and liquid asset (excess over CRR and SLR) reserves of banks with the Bangladesh Bank (Graph 6).

Graph 5: A Comparison of Deposit and Credit Growth



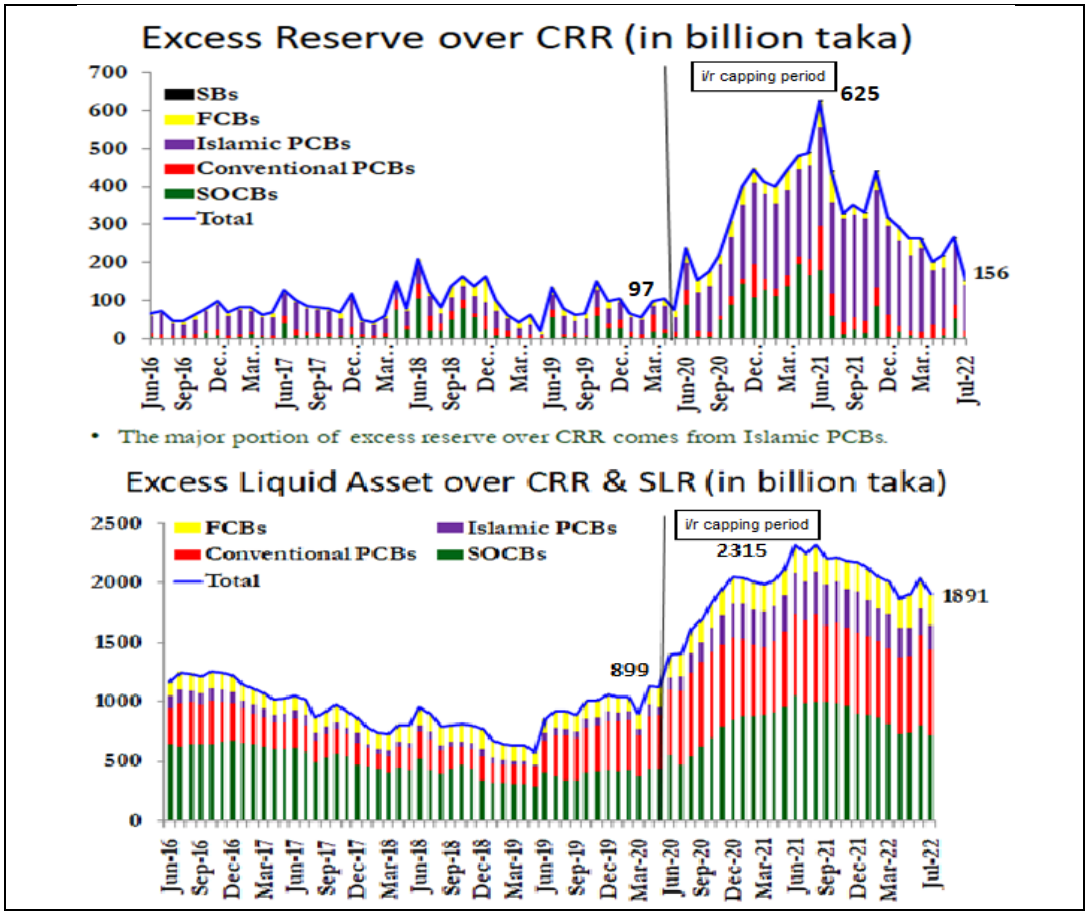
Source: Statistics Department, Bangladesh Bank. Note: i/r means interest rate

[6] Though interest rate is not the only determinant of deposit growth, it depends on other factors such as real income, remittance inflow, current account and overall BoP surplus etc.

[7] In fact, interest rate on deposit was negative in real term both the prior to and after the imposition of interest rate caps but magnitude of negative real return has substantially enhanced in the later period.

Currently, the negative real interest rate on deposits and relatively low lending rate are not only facilitating the domestic demand to increase but also helping to accelerate the imports demand as well. As a result, imports payments have risen to a historically high level and exerted an unusually high pressure on BDT against the USD, though deferred payment of import bills and supply chain disruption due to the pandemic situation of COVID and later on the Russia-Ukraine conflict were also culpable for this unusually high growth of imports.

Graph 6: Surplus Reserves of Scheduled Banks with Bangladesh Bank



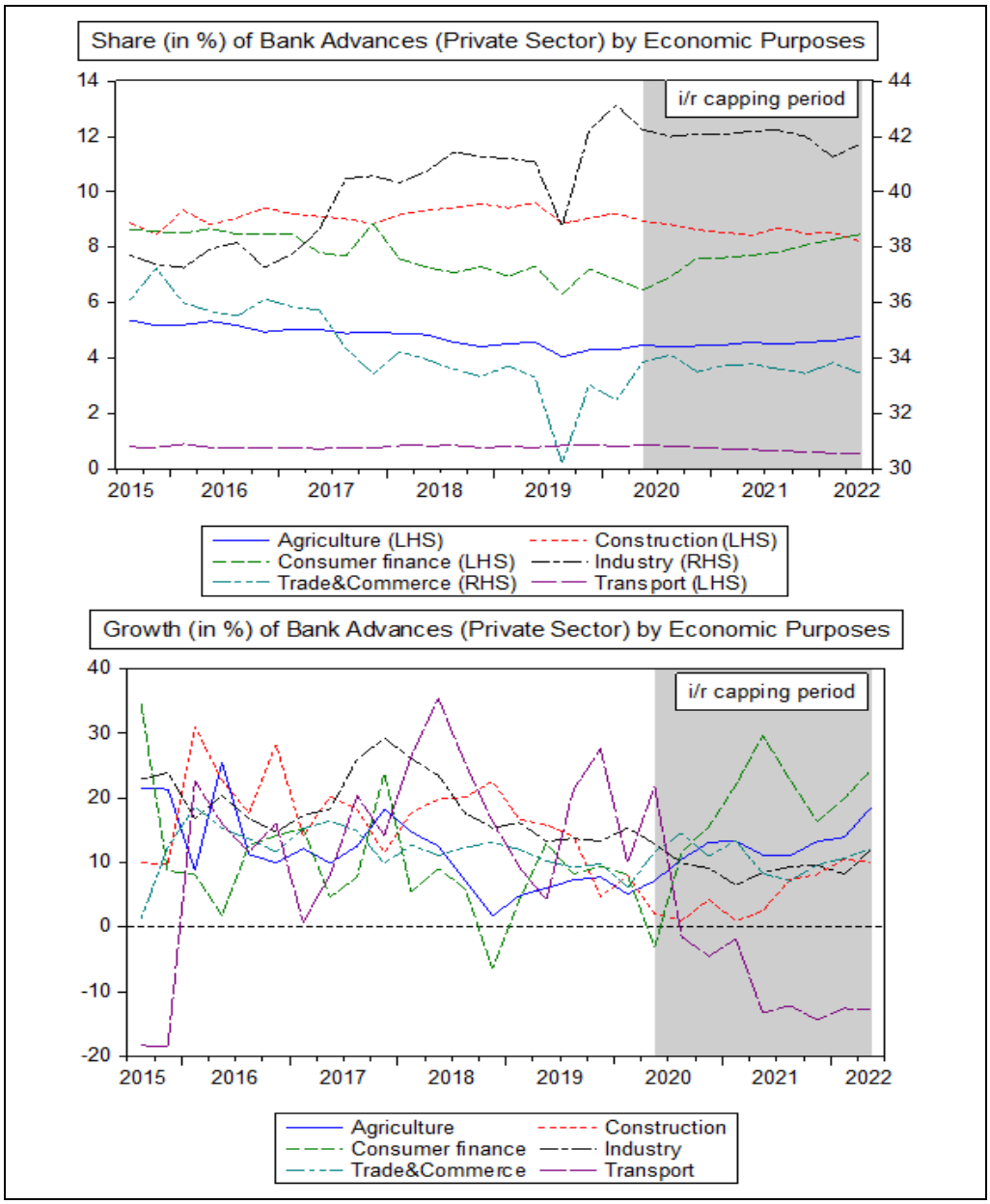
Source: Department of Off-site Supervision and Monetary Policy Department, Bangladesh Bank Note: *i/r means interest rate*

5.5 Banks' Advances to Private Sector on different Economic Purposes

Available data suggests that banks' advances to private sector for almost all the economic sectors have substantially increased in FY22 except transport. The share of bank advances by different economic purposes demonstrates that, over the last six years, the composition of different sectors to total bank advances has been pretty steady. However, in recent years, the percentage of industry and consumer finance has risen, replacing bank financing for construction and trade and commerce.

On the other hand, the growth of bank advances for various economic purposes demonstrates that, over the last six years, the y-o-y growth of bank advances to different sectors has fluctuated significantly. However, since the implementation of interest caps, the growth of bank advances to all sectors has increased, with the exception of the transportation sector.

Graph 7: The Share and Growth (y-o-y) of Bank Loans and Advances to Private Sector by Different Economic Purposes



Source: Statistics Department, Bangladesh Bank. Note: i/r means interest rate

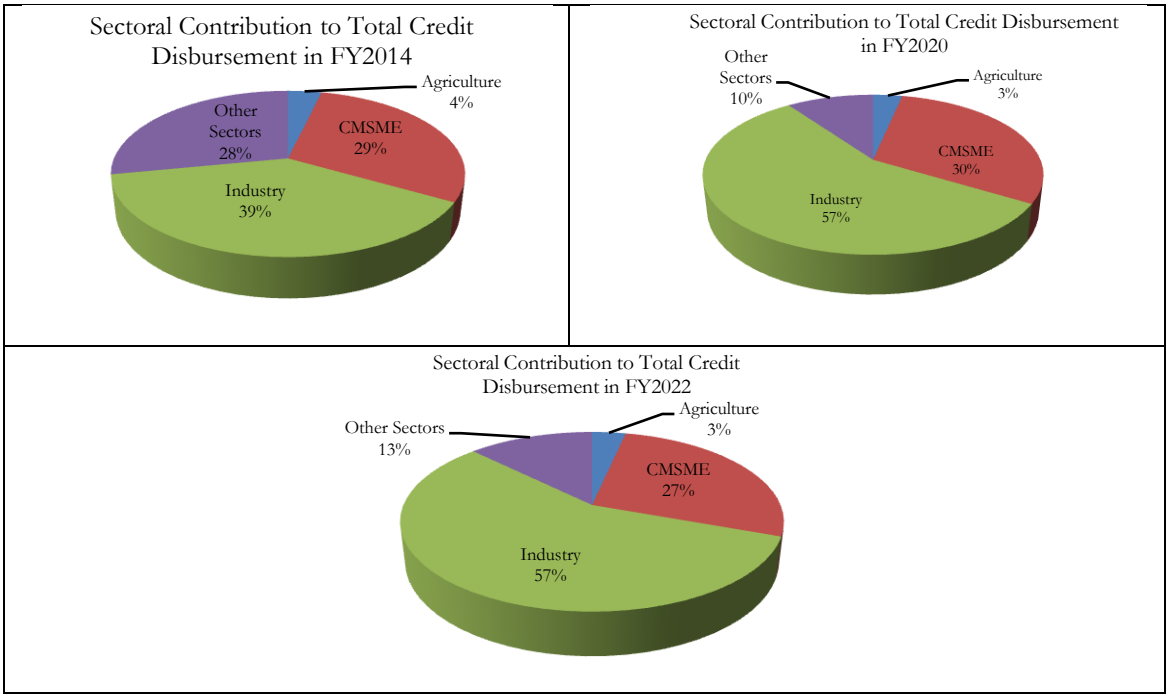
Moreover, the share of the scheduled banks' credit disbursement to the Industrial Sector has sharply increased while the shares to Agriculture, CMSME and other sectors have reduced particularly from FY15 to FY22 (table-1).

Table 1: Total Credit Disbursement to Private Sector and its % Shares to Agriculture, CMSME and Industrial Sector

(Amount in billion BDT)					
FY	**Agriculture**	**CMSME**	**Industry**	**Other Sectors**	**Total Credit Disbursement to Private Sector**
FY14	160.4	1290.7	1684.1	1223.6	4358.8
FY15	159.8	1557.9	2152.6	704.6	4574.9
FY16	176.5	1558.1	2648.9	992.2	5375.7
FY17	210.0	1624.3	3006.7	1200.9	6041.9
FY18	213.9	1538.1	3464.0	1213.1	6429.1
FY19	236.2	1739.0	3998.6	1186.8	7160.6
FY20	227.5	2074.0	3863.9	674.5	6839.9
FY21	255.1	2157.9	3935.9	328.0	6676.9
FY22	288.3	2300.4	4815.2	1070.8	8474.7
(as % share to total private sector credit disbursement)					
FY14	3.7	29.6	38.6	28.1	100.0
FY15	3.5	34.1	47.1	15.4	100.0
FY16	3.3	29.0	49.3	18.5	100.0
FY17	3.5	26.9	49.8	19.9	100.0
FY18	3.3	23.9	53.9	18.9	100.0
FY19	3.3	24.3	55.8	16.6	100.0
FY20	3.3	30.3	56.5	9.9	100.0
FY21	3.8	32.3	58.9	4.9	100.0
FY22	3.4	27.1	56.8	12.6	100.0

Source: Annual Report of BB, SME Quarterly Data, SME&SPD, Statistics Department, BB

Graph 8: Share (in %) of Different Sectors to Total Credit Disbursement by Scheduled Banks

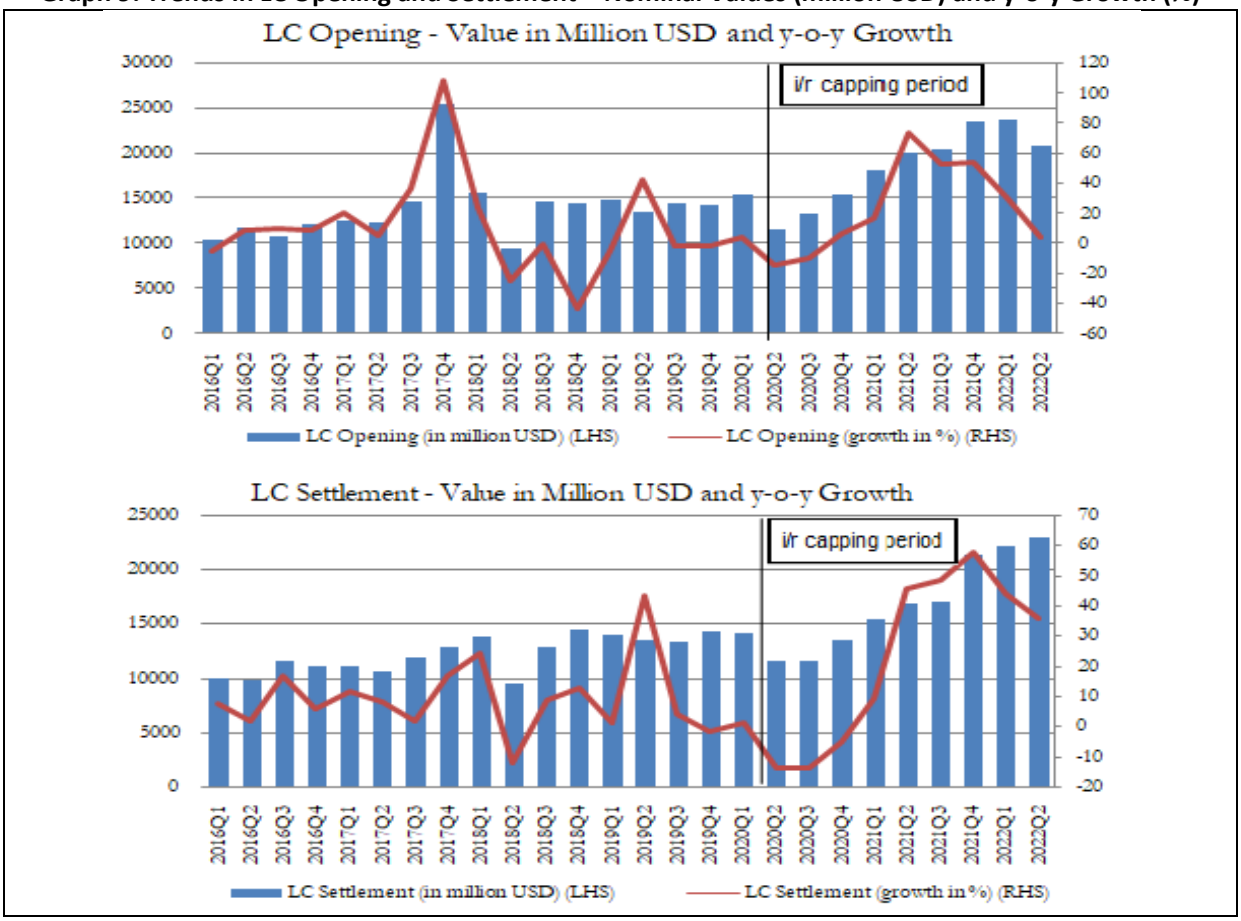


Source: Annual Report of BB, SME Quarterly Data, SME&SPD, Statistics Department, BB

5.6 Banks' LC Opening and LC Settlement for Imports

The imposition of interest rate caps influenced the foreign currency market, as indicated by an increase in the value of LCs opening and settlement. However, due to recent exchange rate volatility and various policy measures undertaken by the central bank to curb consumer financing, both the value and growth of LC opening and settlement have been falling significantly in recent quarters (graph 9).

Graph 9: Trends in LC Opening and Settlement – Nominal Values (million USD) and y-o-y Growth (%)



Source: Foreign Exchange Operations Department, BB. Note: i/r means interest rate

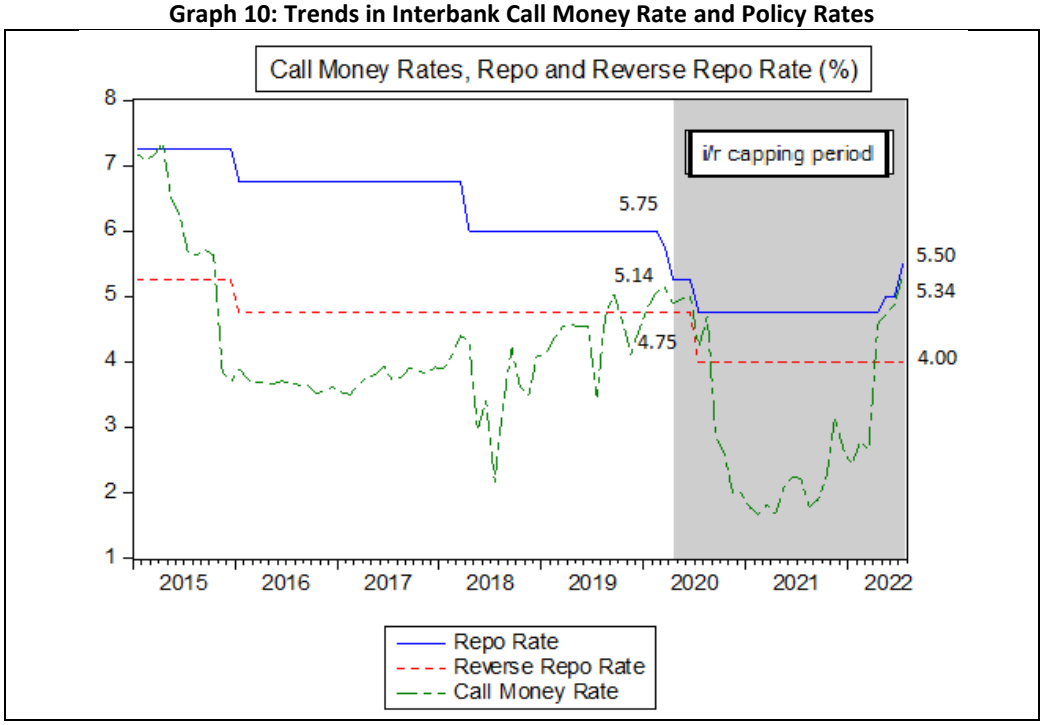
5.7 Upward Pressure on Interbank Call Money Rate

The recent stronger growth of domestic and private sector credit against the slow growth of deposits of the banking system stemming from continuous draw down of foreign exchange reserves due to global commodity price hikes are contributing to shrink cash liquidity and liquid assets of the banking system. Even after imposition of interest rate caps, the interbank call money rate drastically fell due mainly to liquidity glut of the banking system owing from unprecedented monetary policy relaxations[8] for the mitigation of COVID related disruptions. However, due to weak demand both from the domestic and external fronts; until end December 2021, a significant amount of surplus cash (excess over required CRR) and surplus liquid assets (excess over required CRR and SLR) existed in the banking system. With

[8]The CRR and SLR of banks and all other policy rates including repo, reverse repo and bank rate were slashed down several times both before and after imposition of interest rate caps.

substantially improvement of COVID situation, both the domestic and external sectors demand of the economy started to fully resume and substantially improved towards the end of 2021, which are seemingly highly consistent with the high growth of consumer finance and an unusually high growth of LC settlements. Therefore, both the surplus cash and surplus liquid assets of the banking system have now come down to a reasonably low level which is now pulling up interbank call money rate, giving some-what a signal of liquidity tightness in the economy.

Graph 10: Trends in Interbank Call Money Rate and Policy Rates



Source: Department of Off-site Supervision and Monetary Policy Department, Bangladesh Bank. Note: i/r means interest rate

After the imposition of interest rate caps, the interbank call-money rate fell below the historically low level due mainly to an unprecedented relaxation of monetary policy stance by the Bangladesh Bank. The Central Bank's policy responses for fighting against the COVID-19 pandemic through relaxations of monetary policy stance by cutting down CRR and slashing back of repo and reverse repo rates create huge surplus liquidity and subsequently the call money rate pull down to a historically low level making interbank borrowing cheaper than ever before. However, due to recent global economic tensions and exchange rate volatility, call money rates have been rising and surplus liquidity in the money market has already been engaged mostly for financing costly imports influencing the call money rate to sharply increase in recent months.

6. An Empirical Analysis of Lending Rate Sensitivity to Different Macroeconomic Variables

6.1 Sensitivity of the interest rate on Private Investment in Bangladesh

A fundamental view of investment and the traditional theory of monetary policy transmission is that investment expenditures by businesses are adversely affected by the interest rates. However, a large body of empirical research offer mixed evidence. In Bangladesh, most of the literature supports the inverse relationship e.g., Rahman *et al.* (2018). Khan and Jahan (2018), Harun B. *et al.* (2019) found negative relationship between the real lending rate and the investment (Total and Private respectively) while Ahmed and Islam (2005) found positive relationship between the weighted average lending rate and the total advances by the banking sector. The investment demand can be expressed by the following equation: $I = \bar{I} - bi$, Where I= investment, I (bar) =autonomous investment that is unaffected by the rate of interest; i=interest rate (weighted average lending rate); b= coefficient of interest rate sensitivity of investment. Theoretically, investment demand is inversely related to the rate of interest. The degree to which firms adjust investment spending relative to the interest rate is called interest sensitivity that is represented by "b" and the value of this coefficient will be anywhere between zero and one.

To examine the interest rate sensitivity of Investment annual data from 1994 to 2022 on the weighted average lending rate is used as a proxy for the interest rate and private investment are used. An eyeball examination of the data (Graph-11 and 12) show that there is an inverse relationship between the rate of interest and investment in Bangladesh. Correlation Matrix also shows an inverse relationship between the interest rate and the investment. Pair wise Granger Causality Test suggests that null hypothesis of interest rate does not Granger Cause investment is rejected at 10 % level implying that interest rate Granger cause investment (Table-3).

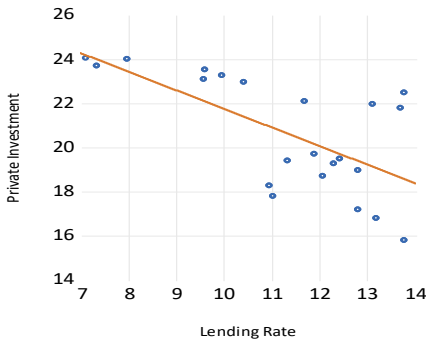
Data Analysis

All the variables used in the model are non-stationary in levels as suggested by the augmented–Dickey Fuller (ADF) and Phillips Perron (PP) methods except for the lending rate and the exchange rate which are stationary at the first differences.

Variables	Test in	Includes	ADF		PP		Decision
			t-statistic	p-value	t-statistic	p-value	
Log of real private investment	Level	intercept	-1.59	0.47	-1.67	0.43	**I(1)**
	First Difference		-4.03	0.00***	-3.96	0.00***	**I(0)**
Log of real GDP	Level	intercept	-3.31	1.00	3.25	1.00	**I(1)**
	First Difference		-3.42	0.01**	-3.36	0.02**	**I(0)**
Real Lending Rate	Level	intercept	-3.10	0.04**	-3.32	0.02**	**I(0)**
Log of real exchange Rate	Level	intercept	-4.07	0.00***	5.04	0.00***	**I(0)**
*** Significant at 1% level, ** Significant at 5% level							

Graph 11 and 12: Scatter plot-Linear Polynomial Fit- sample period: 1994-2022

Lending Rate and Private Investment as a % of GDP



Lending rate and Total Investment as a percent of GDP

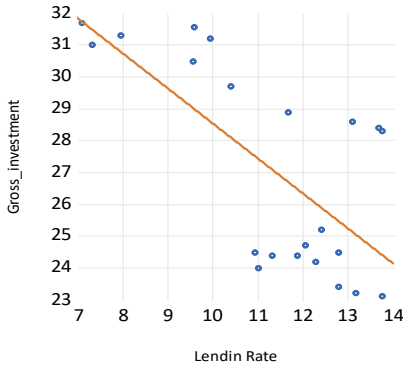


Table-2: Correlation Matrix

	Private Investment	Gross Investment	Lending Rate	Deposits Rate
Private Investment	1			
Gross Investment	0.97	1		
Lending Rate	-0.65	-0.67	1	
Deposits Rate	-0.39	-0.47	0.94	1

Autoregressive Distributed Lag Model (ARDL) is used to estimate the model. There are several advantages of using ARDL over OLS or other models such as Vector Auto Regression Model (VAR) or Vector Error Correction Model (VECM). ARDL model contains the lagged values of the dependent variable, current and lagged values of regressors' as explanatory variables. ARDL model uses a combination of endogenous and exogenous variables, unlike a VAR model that's strictly dependent on endogenous variables. ARDL model could be used when the variables are integrated of different orders. That is, a model

having combination of variables with I(0) and I(1) order of integration. Another advantage of using ARDL model is that it is highly efficient in the case of small and finite sample data sizes. And also by applying the ARDL technique, we can obtain unbiased long run estimates.

Specification of the Model

The functional relationship between private domestic investment spending and its determinants is written as follows:

> *Private Investment (PINV) =f (Real income, rental cost of capital). In addition to that we also used the exchange rate and foreign direct investment variables.*

Co-integrating Regression Model in the long-run

> $Ln\ INV=\alpha_0+\alpha_1\ lnRGDP+\alpha_2\ RealInterest\ Rate+\alpha_3\ ln\ FDI+\ \alpha_4\ ln\ RER+\ \mu_t$ *……(.1)*

The ARDL model for the short run and long run equation

$$\Delta \ln \mathrm{INV}\, t = \emptyset + \sum \varphi_i \Delta \ln INV_{t-i} + \sum \gamma_j \Delta \ln RGDP_{t-j} + \sum \eta_k \Delta \ln Real\ Interet\ Rate_{t-k} + \sum \gamma_l \Delta \ln FDI_{t-l} + \sum \mu_m \Delta \ln E_{t-m} + \theta ECT_{t-1} + \epsilon_t$$

Where ECT is the error correction term and θ is the speed of adjustment.

Bound Test is performed to see the long run co-integration relationship and results are as follows:

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.67	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

F-statistics is higher that then the upper bound of the critical value implying that there is a co-integrating relationship among the real lending rate, real private investment and real GDP and the real exchange rate.

Long-Run Relationship

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RER)	0.80	0.24	3.34	0.02
REAL_LR	-0.05	0.02	-2.16	0.05
LOG(REAL_GDP)	0.90	0.03	24.75	0.00
C	-28.03	0.99	-28.14	0.00
EC = LOG(REAL_PINV) - (0.80*LOG(RER) -0.05*REAL_LR + 0.90 *LOG(REAL_GDP) - 28.03)				

The long run equation shows that real GDP and the real exchange rate are significant and positive with the private investment while the real lending rate is significant and has negative relationship with the real private investment. The equation satisfied all diagnostic tests such as correlogram of Q-statisticsh, LM test for higher order auto correlation and the Heteroskedasticity Test (*results are given at Appendix*).

6.2. Sensitivity of the interest rate on non-performing loans in Bangladesh

The objective of this analysis is to examine whether rate of lending rate has any impact on the non-performing loans in Bangladesh. Private sector credit is used in the growth form while the rate of inflation and lending rate are used in its level form. ADF and PP shows that all the variables are stationary in levels. Therefore, Ordinary Least Square method (OLS) is used to estimate the model. The empirical results from the OLS show that there is a positive relationship between the lending rate and the non performing loans in Bangladesh and the coefficient of non-performing loans to the lending rate is 1.33. This implies that 1 percentage point increase in the lending rate will increase non performing loan by 1.33 percent. The policy implication of this analysis would be to decrease non-performing loan we need to keep the bank's lending rate lower. The coefficient of the private sector credit is also significant and positive implying that the higher the private sector credits the higher the non-performing loans. This suggests that these scheduled banks must be cautious regarding the quality of their loans.

Table-5: Dependent Variable: Non-Performing Loans_All Banks-OLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Lending Rate	1.33	0.32	4.14	0.00
Private Sector Credit	0.16	0.07	2.06	0.05
Inflation	-1.68	0.57	-2.93	0.01
C	-0.03	6.90	-0.00	0.99
Adjusted R-squared	0.51	Durbin-Watson stat	1.99	
F-statistic	6.29			

6.3 Sensitivity of lending rate to different macroeconomic and bank specific variables

An attempt has been made to identify the determinants of the lending rate in Bangladesh. The following model variables have been used to estimate the model. In order to estimate the determinants of lending rate of all scheduled banks and bank group wise Ordinary Least Square (OLS) method is used for the sample period from 2010:Q1 to 2022:Q2. The model variables used are as follows:

Model Variables, Model Specification and Empirical Results

LR= weighted average lending rate of all banks and also bank group-wise;

DR= weighted average deposits rate of all banks and bank group-wise;

INF= CPI Inflation rate (12 month average);

NPL= Non-performing loans of all banks and also bank group-wise;

PSC= private sector credit growth;

NSD= national saving directorate of 3 and 5 years; and

Repo and Reverse repo= policy rates of central bank.

Model Specification

lr= $\int(dr, inf, npl, psc, nsd, polic\ rate)$

lr= $\alpha_{0it}+\alpha_{1i}$dr+ α_{2i}inf+α_{3i}npl+ α_{4i}policy rate+α_{5i}NSD+α_{6i}PSC+ε_t

$expected\ parameters, \alpha 0i \ldots . \alpha 6i > 0$

Private sector credit is used in the growth form while rate of inflation, non-performing loans, lending and deposits rate, repo and reverse repo have been used in its level form.

Empirical results: All Banks

The deposit rate and the inflation for all banks are significant at 1 percent and 5 percent level respectively and appear with the expected positive and negative signs. This implies that one percentage point increase in the deposits rate will increase the lending rate by 0.88 percentage points. Both 3 and 5 year NSD certificate rates are significant for all banks and so is repo rate.

Table-6: Dependent Variable: Lending Rate_ All Banks

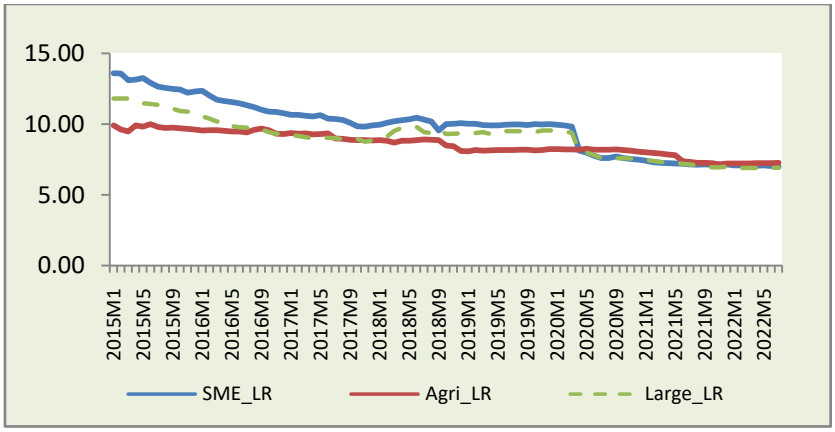
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Deposit Rate_ All Banks	**0.88**	**0.08**	**11.59**	**0.0000**
REPO	0.41	0.09	4.17	0.0004
C	4.36	1.50	2.90	0.0081
NSD_3_YEARS	0.76	0.18	4.11	0.0004
INF	-0.30	0.11	-2.71	0.0124
NSD_5_YEARS	-0.57	0.12	-4.52	0.0002
DUMMY	0.36	0.11	3.23	0.0037
Adjusted R-squared	0.98			
F-statistic	392.00	Durbin-Watson stat		2.04
Prob(F-statistic)	0.000000			

As we know that Bangladesh bank declared interest rate cap on April, 2020 to increase economic activity by reducing cost of borrowing from the banking sector. Banking sector data on various indicators show a clear sign of downward adjustment of the lending and deposits rates and the whole term structure of the interest rates (graph 13).

In case of banks profit Graph-14 and 15 shows that in fact profit increased in recent periods time of all group of banks particularly foreign banks. Although these banks charge lower rates of interest, their cost of fund is also lower.

Sector-wise interest rate data shows that compared to Agriculture and CMSME sectors large industry sector enjoying lower lending rates during the interest rate cap period compared with the earlier periods which raise concern regarding the objectives (graph 13).

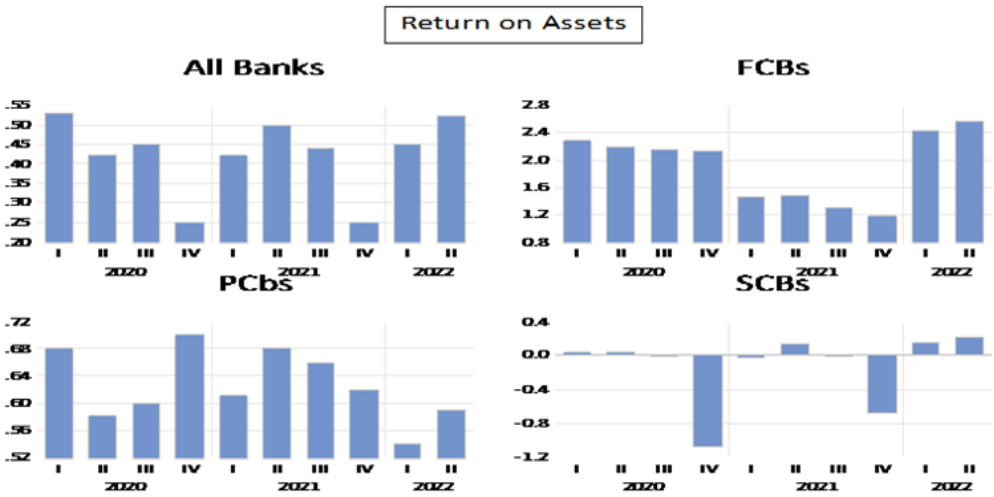
Graph-13: Sector-wise interest rate data



Return on Assets (ROA)

Return on Assets (ROA) of Banks show that more or less profitability has increased in 2022 first and second quarter of all group of banks even though interest rate decreased of all banks as well as all groups of banks.

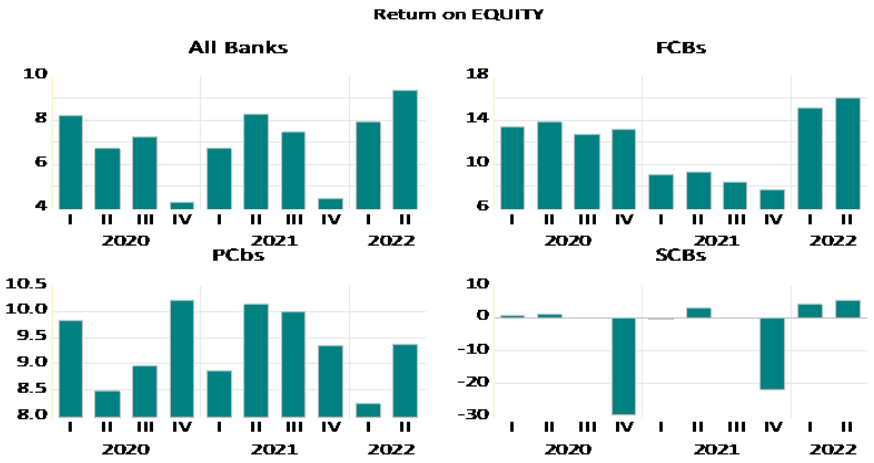
Graph-13: Return on Assets



Return on Equity (ROA)

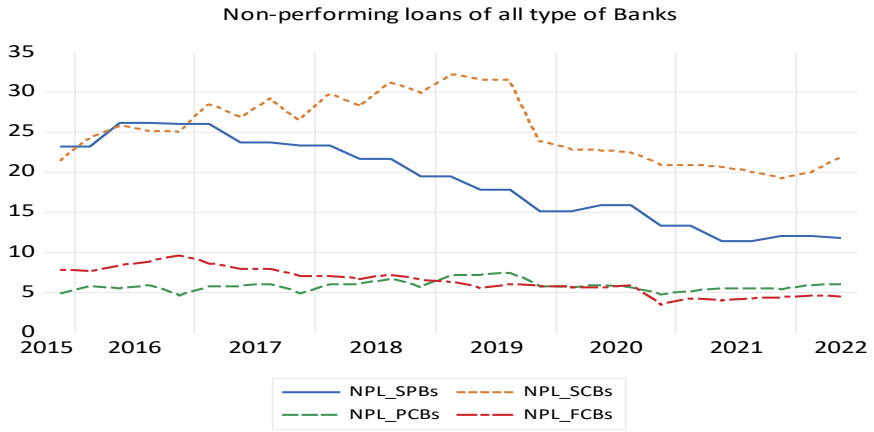
The same story is true for Return on Equity (ROE) of Banks. ROE has also increased of all groups of banks.

Graph-14: Return on Equity



Non-performing Loans

Non-performing loans of all types of banks showed downward trend since the imposition of interest rate cap; implying that lower the lending rate lower the non-performing loans which also support the regression results.



6.4 Major Findings of the Empirical Exercises

Major findings of the empirical exercises are summarized below:

1. There is an inverse relationship between the private investment and the lending rate.
2. The relationship between the lending rate and the deposit rates also very positive as we have seen from the regression analysis.
3. The relationship between the weighted average lending rate and the non-performing loans are also significant and positive.
4. Profitability of banks increased despite lowering the lending rates.

7. Concluding Remarks and Policy Recommendations

Overall observations of the study indicate that effort towards rationalization of interest rate on lending was a long demand for easing cost of doing business in Bangladesh. The emergence of pandemic situation of COVID-19 and a multilevel discussion among various stakeholders created a well justified ground to impose interest rate caps by Bangladesh Bank. It is also required to mention that interest rate cap on lending may have helped to some extent in maintaining a reasonably good growth momentum along with price stability in Bangladesh economy during the pandemic situation while other countries have faced severe setbacks. However, given the very recent monetary and credit situation and macroeconomic developments, following policy options can be considered to adopt on a short and medium term basis especially for strengthening monetary policy transmission mechanism and for checking potential inflationary pressure and tranquil the ongoing rally of demand push exchange rate depreciation.

In the last Monetary Policy Statement, FY 2022-23, Bangladesh Bank has already given a signal of tightening the monetary policy stance through increasing the repo rate. Following the global trend of historically high inflation rate and recent price hike of fuel oils in our domestic market, further tightening of monetary policy may be required in the coming months and without moving or removal of interest rate caps, any policy rate hiking seemingly may not be effective to transmitting the signal to the real sector of the economy. Therefore, existing interest rate caps can completely be repealed with attaching a big emphasis on moral persuasion on banks for keeping lending rate at a single digit so that the recent advancement made through lending rate cap does not fully foil.

The study finds that recent lower lending rate through interest rate cap has been a blessing for the industry sector receiving lion shares (nearly 60 percent) of total private sector credit disbursement by the scheduled banks while shares to the agriculture, CMSME and others have suffered a slight setback. The demand supply mismatch is arising recently mainly from the external sector of the Bangladesh economy due mainly to rising credit demand while supply of loanable fund is decreasing owing from slow growth of deposit. Although many steps have already been undertaken particularly for restraining the import demand, but only the market based mechanism can be an appropriate solution to mitigate the ongoing supply-demand mismatch situation.

Finally, progress and advancement that we have made in Bangladesh economy is believed to have come through financial deregulation through FSRP. In order to promoting a market based development in the financial sector and for modernizing the existing monetary aggregate based policy framework, removal of broad-based interest rate cap will be essential at least in the medium to longer term. Therefore, in order to strengthening the monetary transmission channels, Bangladesh Bank may start to target the interest rate i.e. the call money rate as practiced in other peer central banks in the region.

References

Ahmed, S and Ezaz. Md. Islam (2004), Interest Rate Responsiveness of Investment Spending in Bangladesh, *The Bangladesh Development Studies Vol. XXX, March-June 2004, Nos.l & 2.*

Baqui Khalily, M.A. & Khaleque, M.A. (2012). Access to Credit and Productivity of Enterprises in Bangladesh: Is There Causality?

Bodenhorn, H.(2007). Usury Ceilings and Bank Lending Behavior: Evidence from Nineteenth-Century New York. *Explorations in Economic History 44 (2): 179–202.*

Castellanos, Sara (2012). "Interest Rate Caps: Back to the Future in LatAm?" *Economic Watch (January)*

Consultative Group to Assist the Poorest-Microfinance Information Exchange (CGAP-MIX) (2011). Sub-Saharan Africa Microfinance Analysis and Benchmarking Report 2010.

Deakin, Simon, Panicos Demetriades, & Gregory James (2010). Creditor Protection and Baking System Development in India. *Economics Letters 108 (1): 19–21.*

Harun, B. et al. (2019). Private Investment Demand Function in Bangladesh: An ARDL Approach, *Asian Business Review, 9(1):37-42.*

Hasan, M.Z. (2019). Macroeconomic Determinants of Non-Performing Loans in Bangladesh: An ARDL Approach. *Sci. Res. J., 7, 84–89. 42*

Hasan, K. & Khan, R.S.(2013). Management of Non-Performing Loans (NPLs) of Banks in Bangladesh-An Evaluative study. *J. Econ. Financ. 2013, 1, 1–15.*

Helms, Brigit & Reille, Xavier (2004). Interest Rate Ceilings and Microfinance: The Story So Far, *CGAP Occasional Paper no. 9*

Islam, M.Z.; Aktar, S.; Hossen, M.A.& Islam, M.S. (2018). Non-Performing Loan And Asset Utilization of Banks: Evidence From Bangladesh. *Romanian economic business review, 13, 31–39.*

Khan Md. Saidjada and Syeda Ishrat Jahan (2018), Public and private investment nexus in Bangladesh: crowding-in or out? *The Journal of Developing Areas, Volume 52 No. 4 Fall.*

Maimbo, Samuel Munzele and Gallegos, Claudia Alejandra Henriquez (2014). Interest Rate Caps around the World Still Popular, but a Blunt Instrument. *Policy Research Working Paper 7070, World Bank Group, Finance and Markets Global Practice Group*

Miller, Howard (2013). Interest rate caps and their impact on financial inclusion. *Economic and Private Sector, Professional Evidence and Applied Knowledge Services. February 2013*.

Mondal, T. (2016). Sensitivity of non-performing loan to macroeconomic variables: Empirical evidence from banking industry of Bangladesh. *Glob. J. Manag. Bus. Res. 2016, 16, 4-C.*

Office of Fair Trading (2010). Review of high cost credit - final report. Annex B: Evidence and Arguments Surrounding Price Control and Interest Rate Caps for High-Cost Credit. *OFT1232, United Kingdom.*

Porteous, David, Daryl Collins, & Jeff Abrams (2010). Interest Rate Policy. *Policy Framing Note 4, Financial Access Initiative.*

Rahman, Md. Habibur, Hoque, Md. Rezwanul, Siddique, Md. Nur-E-Alom (2018), Single Digit Interest Rate: Bangladesh Perspective, *Unpublished Policy Paper, Chief Economist Unit, Bangladesh Bank*

Roy, S.; Dey, P.K. & Bhowmik, P. (2014). Non-performing loans in private commercial banks of Bangladesh: Macro-economic determinants and impacts. *Jahangirnagar Journal of Business Studies, 4, 47–57.*

Van Rooyen, C., R. Stewart, T & De Wet (2012). The Impact of Microfinance in Sub-Saharan Africa: A Systematic Review of the Evidence. *World Development 40 (11): 2249–62.*

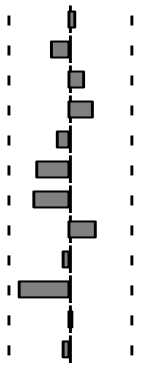
Younus, Sayera; Akhtaruzzaman, Mohammad; Islam, Touhidul & Islam, Sirajul (2020). Lending Rate Behavior in Bangladesh: Some Facts and Determinants. *Bangladesh Bank Working Paper Series: WP No. 2003*

Younus, Sayera (2007). Causes, Consequences and Policy Implications of Non-Performing Loans in Bangladesh. *Journal of the Institute of Bankers Bangladesh (IBB), July-December 2006 and January-June 2007. Volume 53, 54*.

Zheng, Changjun, Bhowmik, Probir Kumar, & Sarker, Niluthpaul (2019). Industry-Specific and Macroeconomic Determinants of Non-Performing Loans: A Comparative Analysis of ARDL and VECM.

Diagnostic Check: Correlogram of Residuals

Date: 09/22/22 Time: 00:24
Sample (adjusted): 1995 2021
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.040	0.040	0.0480	0.827
		2	-0.104	-0.106	0.3890	0.823
		3	0.085	0.095	0.6258	0.890
		4	0.150	0.133	1.3922	0.846
		5	-0.073	-0.070	1.5810	0.904
		6	-0.195	-0.175	2.9935	0.810
		7	-0.228	-0.269	5.0237	0.657
		8	0.164	0.155	6.1295	0.633
		9	-0.035	-0.028	6.1827	0.721
		10	-0.299	-0.211	10.305	0.414
		11	-0.002	0.016	10.305	0.503
		12	-0.040	-0.213	10.388	0.582

*Probabilities may not be valid for this equation specification.

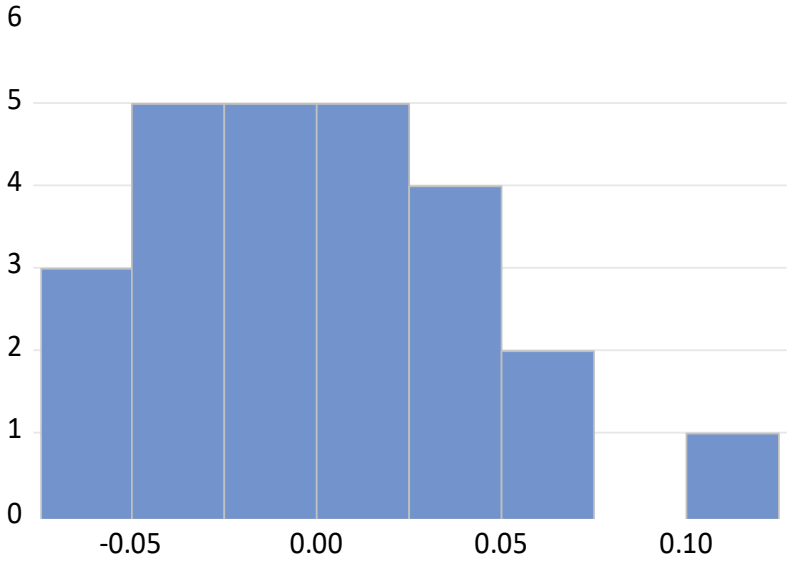
This model satisfies all the diagnostic tests such
Correlogram of Q-statistics
LM test for higher order auto correlation
And Heteroscadastcity Tests
Stability Tests

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 1 lag

F-statistic	0.348837	Prob. F(1,16)	0.5630
Obs*R-squared	0.533429	Prob. Chi-Square(1)	0.4652

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.847688	Prob. F(7,17)	0.5644
Obs*R-squared	6.468415	Prob. Chi-Square(7)	0.4862
Scaled explained SS	2.464080	Prob. Chi-Square(7)	0.9298



Series: Residuals	
Sample 1996 2020	
Observations 25	
Mean	-7.54e-15
Median	-0.002035
Maximum	0.100735
Minimum	-0.066702
Std. Dev.	0.042517
Skewness	0.369517
Kurtosis	2.647666
Jarque-Bera	0.698239
Probability	0.705309

CUSUM Test **CUSUM of SQUARES**