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Association between Interest Rate Changes and Profitability of Commercial Banks of Bangladesh

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Abstract:
Commercial banks play a crucial role in the context of modern business world. Being financial intermediaries, banks effectively contributes to the economic growth of our country. The relationship between changing interest rates and its impact on bank's profitability has become a sensitive fact of having paramount importance. A comprehensive study has been conducted by using 5 consecutive years' data (2014-2018) of all the 30 listed commercial banks of Bangladesh. The secondary data was collected from annual reports of corresponding commercial banks. This study represents the association and effect of interest rate changes on bank's profitability. It also shows empirical charts, graphs regarding analyzing data and communicating results. This report has been divided into seven chapters for the convenience of preparation. Descriptive analysis, linear regression analysis, multivariate analysis, analysis of variance, correlation analysis, multicollinearity test and durbin-watson test have been carried out to establish and explain the relationship between stated two facts. It is derived from the study that change in Interest rate has significant impact on the profitability of commercial banks. Interest rate spread positively impact the profitability measures of the study (ROE, ROA, and NIM).

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1. Introduction

1.1 Background of the Study

Financial system of a country mainly portrays arrangement of financial institutions, financial services that depict the link between depositors and investors. It incorporates central bank, commercial bank, public banks, co-operative banks, insurance companies and non-bank financial institutions. An efficient financial system ensures secured financial transactions, effective payment mechanisms, security market, derivative markets etc. Bangladesh Bank centrally manages all other banking operations carried out within the banking industry. Besides, the Securities and Exchange Commission (SEC) of Bangladesh assures prudential administration and regulation for stock market related activities.

Commercial Banks play an imminent role in economic development and growth of any country. They assist in capital accumulation, creation and distribution of fund, mobilization of saving, implementation of modern technology, market expansion, foreign trade, and optimum utilization of resources. Commercial Banks play an undeniable role in the economy through their economic assistance as financial intermediation that executes both a brokerage and a risk conversion activity (Hara, 1983). In regard to a developing economy like Bangladesh, commercial banks boost up employment generating financial activities, providing customer credits, financing trade and agriculture and following monetary policy of the central bank. Commercial Banks mobilize funds through transferring funds from depositors to borrowers. These financial intermediaries directly impact the bank's profitability and thus contribute to its economy. Growth and development of any economy are related to profitability of commercial banks (Wainaina, 2013). Commercial banks usually employ their investment at a higher interest rate compared to the interest rate they apply on deposits. The difference between interest income and interest expense is generally known as bank's profit. Considering the recent trend of market liberalization, interest is referred as a phenomenal factor and its enhancing volatility has immense effect on global economy. This change in interest rates contributes significantly to the fluctuations in bank's profitability. Consequently several researchers, policy makers have shown their keen interest in the impact of rate fluctuations on bank's profitability.

Interest rate spread has seen to remain high in Bangladesh relative to the regional and global rates since independence in 1971. The standard setters and practitioners have continually expressed their concern regarding stability of interest rate spread in the banking sector. This volatility or change affects bank's progress and thus results in economic recession, growth, inflation etc. On the same way, interest rate is also shaped because of the change in above factors. Chen *et al.* (1986) considered macroeconomic factors having material impact over commercial bank's profitability. Hence, interest rates and profit reflect negative correlation as low interest rates allow businessmen to borrow money at a cheaper cost of capital. Again, interest rates have positive correlation with savings as it goes up. It encourages investors to save and invest more. A currency having higher interest rate adds to the profitability of a FOREX position. Interest rates maintain a negative correlation with stock market. Because of exertion of low interest rates, investors are attracted to invest in stock market rather than investing in bonds or savings. This potentially boosts overall stock market performance. Therefore, determining the impact of interest rate changes on commercial bank's profitability has become an emerging controversial issue around the world. However, the financial performance of commercial banks can be affected by both internal factors as well as external factors (Al-Tamimi, 2010; Aburime, 2005). So, the profitability is also determined by

incorporating many other factors other than interest rate spread. Internal factors are decided by management mostly. The external factors are sector wide or country wide factors which are beyond the control of the company and affect the profitability of banks (Ongore, 2013). This profitability measurement varies from economy to economy. Determinants of bank's profitability in one continent are different from another continent (Yuqi, 2008).

1.2 Related Definitions

Interest spread:

Commercial banks generate their main stream of profit through this. Banks pay interest to depositors at a lower rate than that of they receive from the borrowers as loan interest. The net interest spread is the difference between the average yield the bank recognizes from loans and the average yields it pays on deposits and borrowings. A related concept- Net Interest Margin (NIM) is defined as the difference between interest income and interest expense per unit of total banks earning assets.

Interest rate volatility:

It refers to the volatility of interest rates on borrowing and savings over time. It has considerable effects on businesses as it causes fluctuations among borrowing costs and investment earnings. In case of banks, if interest rates changes, it changes the value of its assets and liabilities because of their interest rate sensitive characteristics. Generally, when interest rate rises, it strengthens savings practices of investors from which banks make more profits. On the other hand, if interest rate is lower, it narrows the spread and ultimately banks experience lower profits. Financial institutions have to deal with several risk factors. Among those risks, interest risk is prominent as well as liquidity, default risk. Interest rate risk has been emerged as being more acute and sensitive to financial institutions than default risk (Kohn, 2004). The risk exposure can be measured by different established models to protect against an ultimate insolvency state. Another relevant topic to the above issue is Interest Rate Risk which can be defined as the volatility of interest rate in a money market causing the shift in the value of asset and liabilities of banks which are interest rate sensitive in nature.

Bank rate:

It is the interest rate at which a country's central bank allows other domestic banks to borrow funds from it. Through managing bank's rate central bank affects economic factors such as inflation, exchange rate etc. it is also referred to discount rate or Repo rate which impacts a nation's economy. For example, stock prices tend to react to unexpected interest rate changes. It also influences the prime interest rates for consumer credit.

Profitability:

To satisfy their economic interest, commercial banks operate business to make profits. Different factors determine total amount of profits. Profitability is a comparative measurement tool for comparing bank's financial performances. Some ratios related to the measurement of profitably are such as-

ROE (Return on Equity) = Net Income / Shareholder's equity

ROA (Return on Asset) = Net income / Total assets

NIM (Net Interest Margin) = (interest income – interest expense)/ Total earning assets

- (Total earning assets include loans & advances, balance with other banks and financial institutions, money at call & short notice, investment.)

Though banks should make profit to continue and grow over the periods, decision makers should not concentrate only on profits. They should consider other qualitative aspects, stakeholders' interest etc.

1.3 Research importance

There is a direct and crucial relationship between interest rate changes and commercial banks profitability which is to be tested and analyzed for determining the sensitivity between these two components of a bank's financial performance. Several researchers from different countries around the world including developed and developing economies have conducted studies to represent the issues through descriptive statistical and empirical analysis as well. The prime focus of this report is to depict and summarize the analysis on stated issue in the context of Bangladesh by taking 30 listed commercial banks. Interest rate spread and several indicators of profitability such as ROE, ROA etc are discussed and examined to reflect practical scenario.

1.4 Objective of the report

The main objectives of this report are to establish and explain the association between interest rate and profitability, to incorporate recent trends in bank rate and interest rate spreads, to determine the factors that affect interest rates, to evaluate the impact of interest rate changes on profitability determinants, to represent empirical as well as graphical description of relevant results, to analyze the comparative data of several consecutive years and also to summarize the findings regarding cause and effect relationship between two stated issues

1.5 Scope of the report

In this report there is an extensive study that has been conducted with due focus and sincerity. Contextual background, recent trends and significant factors have been analyzed and finding have made clarified with recommendations about potential areas for further research. So, listed commercial bank's financial data been examined for ten consecutive fiscal years. During the preparation of the report a brief idea about interest rate composition and its fluctuations, impact of interest rate volatility on profit making ability of commercial banks, trend and causes of interest rate changes, overall relationship between two discussed factors are presented.

2. Literature Review

This chapter focuses on the prior studies and their findings regarding stated thesis topic. As having scarcity of local literature on the concerned topic, focus has been maximized to international and global view. Both theoretical and empirical literature review have been associated in this particular chapter.

2.1 Theoretical Review:

Several theories regarding the discussed arguments have been presented here which has guided the study. Relevant theories that reflect the relationship between interest rate changes and commercial banks' profitability are being summarized below:

Schumpeter Economic Cycle Theory:

Schumpeter (1939) described cyclical process of economic changes as business cycle where he distinguished two stages- "Prosperity" and "Recession". The intermediary role of financial institutions contributes to the economic growth by credit creation. When economy expands, banks' interest income also accelerates because of increasing demand of credit. In the time of economic recession, banks profitability collapses oppositely. Consumers shape their savings decision considering available real interest rate in an actual business cycle. This theory considers that interest rate changes affect commercial banks profitability. And interest rates are determined by macro-economic factors.

Keynes's Liquidity Preference Theory:

Keynes (2006) indicated that demand and supply of money determine interest rates. He explained that need for money is occurred as a precautionary measure or for speculative objectives. As income increases, demand for money also goes higher. But interest rates are negatively related with the speculative demand for money. On the other hand, money supply is determined by the central bank, lending capacity of commercial banks, public proneness to hold or to invest cash. So, when the time to maturity is extended, premium demanded by the depositors also increases. In the same way, prevailing interest rates reflect prospective inflation rates, income and probable money supply fluctuations. In this study, the theory depicts the fact that interest rates are guided by liquidity position in the economy. Thus, interest rates change by the floating liquidity in an economy and preference of that liquidity by its users.

Macroeconomic Theory:

Friedman and Harberger (1963) proposed that excess money supply compared to normal growth is responsible for interest rate acceleration. Lack of equilibrium in foreign and labor market causes fluctuations of interest rates in local market. So, Government has to deal with this disequilibrium for bringing macroeconomic rotational movement. When inflation takes place, other macroeconomic variables are placed to bring a balance in overall economic condition. This adjustment process also affects profitability of banking sector.

2.2 Empirical Review:

NGURE (2014) made a study in Kenya obtaining secondary data from commercial banks to describe the relationship between interest rates and financial performance. He found a linear relationship between interest rate increasing with banks profitability. Bank size and interest rate volatility had considerable effect on banks profitability. Here, it is recommended that the policies should be made to shield bank lending rates. In the time of economic downturn, monetary policy can be made to risen interest rates to improve banks profitability.

Public and private sectors commercial banks may exert different reaction to interest rate changes. Generally it is thought that private banks are more likely sensitive to the interest rate fluctuations. Malik *et al* (2014) categorized and analyzed data of both private and public commercial banks separately in the context of Pakistan. The study concluded that interest rates have more impact on commercial banks profitability determinants (ROE, ROA) in private banks compared to public banks. Saunders and Schumacher (2000) explained a model on countries of Europe and United States and depicted that interest rate volatility has positive effect on commercial banks net interest margin. Khan *et al* (2014) examined the fact by categorizing sample commercial banks into private and public sector division. It was suggested that interest rate has more effects on both of the profitability measures i.e. ROE and ROA in private banks compared to public banks. Khan and Sattar (2014) found a strong and positive correlation between interest rate and commercial banks profitability while analyzing data of commercial banks in Pakistan. It was noted that interest rate trends have major impact on savings pattern of people. Interest rate is considered as a managing and controlling tool by State Bank of Pakistan in regard to foreign trade rates and inflation. Banking industry faces active competition. For this, interest rates remain in a relative range among banks. The study of Paul (1945) showed that increasing effect of interest rates basically affect the depositors and borrowers. Both of them are discouraged for tolerating higher cost of funding. He also showed that increasing interest rates has no such effect on banks profitability because banks make more profit by charging more interest from borrowers but on the same time savings goes lower as changing of savings preferences taken place by depositors. Borrowers experience the same scenario. It offsets the effect of

increasing interest rate on profitability. When interest rates are lowered, it attracts people to save more and consume less and also enables businesses to easily take loans for investment purpose. Moreover, this phenomenon accelerates economic growth and national income. Gilchris (2013) stated that high interest rates eliminated demand for loan as the loan market is very much elastic in nature.

Banks profitability is determined by several factors. Banks' characteristics are one of those. Buyinza (2010) revealed that bank characteristics such as capital, bank size, credit risk, per capita GDP, growth rate, inflation etc. have significant positive impact on banks financial performance. Capital accumulation and maintaining its level is a role of commercial banks. Yuqi (2008) analyzed the fact related to the thesis topic and found that capital adequacy has considerable positive effect on profitability. On the other hand, credit and liquidity risk has maternal negative impacts on profitability. Dang (2011) stated that adequate level of liquidity is positively related with banks profitability. Ali *et al* (2011) found that banks profitability is negatively affected by capital and credit risk in Pakistan. Besides macroeconomic control variables such as money supply, inflation as well as interest rates; earnings ability, liquidity, asset quality (CAMEL), internal management efficiency also positively affect banks profitability. Gilchris (2013) studied that net interest spread, industry production growth rate, bank size (both internal and external factors) are positively correlated with profitability i.e. ROA and ROE. Rachdi (2013) considered that profitability determinants (ROA, ROE, NIM) are positively affected by liquidity, capital availability, size and annual GDP growth. (Macharia, 2013) carried out a study in Kenya and indicated that inflation and interest rates are negatively correlated with each other. Revell (1979) noted that inflation causes operating expenses i.e. wages to also increase. This firmly affects banks profitability. Wambari and Mwangi (2017) examined commercial banks in Kenya and concluded that interest on deposit has to be monitored carefully as it negatively affects banks profitability whereas interest on lending positively influence commercial banks profitability. Irungu (2013) concluded that interest rate spread has strong positive effect on performance of assets which affect banks profitability. Okech (2013) interpreted in his undertaken study that revenue sources of commercial banks should be diversified and management should be enriched as having a weak positive correlation between lending rates and profitability of commercial banks. Murty and Chowdary (2018) inferred in a study done by taking nationalized commercial banks of India which depicted that interest rates exert significant influence on their profitability. Shashi and Divya (2010) found that among different business risks, interest rate changing risk is the most effective one to impact banks financial performance and economic condition. According to (English, 2000) to trace the volatility in banks profitability, fluctuation of interest rates is a must. Impact of interest rate on cash flow is also to be measured. Peng *et al* (2003) suggested in their research in Hong Kong that if interest rate declines, net profit margin goes higher. On the other side, United States experiences a little effect of increasing interest rate on profit margin. Flannery (1981) conducted a study in USA and concluded that market interest rates have negative effect on commercial banks profitability. Large banks tend to hedge themselves against fluctuations in market rate. They assemble asset and liabilities portfolios where average maturities are quite similar. Cai and Wang, (2006) did not find interest rates changes statistically significant in relation to profitability of commercial banks in Canada. Ahmed and Rehan (2018) considered interest rates having negative correlation with banks profitability. Gull and Zaman (2015) evaluated significant impact of interest rate on financial performance of commercial banks that are continuing their operation in Pakistan. Musah and wasi (2018) examined that interest rate spread positively

affect banks profitability and suggested that if demand for loan exceeds the supply; then interest rate goes higher resulting into increasing profitability. Obidike *et al* (2015) concluded that interest rate spread had a negative correlation on profitability of commercial banks of Nigeria. Moreover, most of the studies regarding the association between interest rate changes and commercial banks profitability have been carried out in different regions of the world; mostly in developing countries such as Kenya, Nigeria, and Pakistan etc. There is a prevailing gap in regard to the availability of local literature on this topic done particularly in the context of Bangladesh. This study attempts to bridge that gap.

This report will try to answer the question whether interest rate fluctuations exert significant influence on the profitability of listed commercial banks or not, what are the main factors responsible for interest rate volatility, how interest rate spread impacts on the profitability determinants and what are the variables other than interest rate that may affect banks' financial performance.

Table 1: Summary Table of Literature Review

Author's Name	Sample	Year of Study	Dependent Variable	Independent variable	Findings and Results of Experiment
Ngure	All commercial banks of Kenya	2014	ROA	Interest rate Size of bank	Linear relation between interest rate and profitability
Khan and Sattar	4 major commercial bank of Pakistan	2014	Profit after taxation	Interest rate	Strong positive relation between interest rate and commercial banks profitability
Wambari and Mwangi	43 commercial banks in Kenya	2017	ROA	Lending rate ratio	Significant positive relationship between lending rate ratio and financial performance of commercial bank
Malik et al	4 public commercial banks and 6 private commercial banks in Pakistan	2014	ROE ROA	Interest rate	Interest rate having more impact on private commercial banks profitability and lesser impact on public commercial banks profitability
Murty and Chowdary	19 nationalized bank of India	2018	ROA ROE RCE	Interest rate	Interest rates having significant influence on profitability
Ahmed et al	20 commercial banks	2018	ROA ROE EPS	Interest rate changes Advances on loan Investment	Deposit with other banks and interest rate are negatively affecting profitability, while advances and loans & investment are having positive influence over profitability
Cai and Wang	7 commercial banks of Canada	2006	NI ROA NIM	Interest rate	Significant negative relation between banks stock return and changes in interest rate
Musah et al	24 commercial banks	2018	ROA ROE	Interest rate spread	Significant positive relation between interest rate spread and profitability
Flannery	30 commercial bank of USA	1981	Revenue Cost	Interest rate	Interest rate having negative impact on commercial banks profitability
Kalsoom and Khurshid	29 banks of Pakistan	2003	ROA	Interest rate spread	Positive relation between interest rate spread and profit margin

3. Review and Methodology

3.1 Review of Interest Rate Spread Behavior in Bangladesh

Interest Rate Spread (IRS) is considered a crucial determinant regarding economic stability of any country. IRS represents the efficiency of the fund management of any banking company. High IRS is thought to be the barrier of savings, economic growth and overall results into operational inefficiency within commercial banks. There is no standard limit or level of IRS. Bangladesh Bank tends to prefer low range of IRS (below 5%) in general. Some neighboring countries i.e. Sri Lanka, Pakistan, India maintain lower IRS relative to Bangladesh.

Table 2: Interest Rate Spread in the SAARC Countries

Country	2010	2011	2012	2013	2014	2015
Bangladesh	5.30	5.15	5.60	5.13	5.31	4.85
Pakistan	5.90	6.20	5.50	4.80	4.50	-
India	3.25	-	4.80	4.50	4.50	-
Bhutan	12.00	9.50	8.50	8.00	10.20	9.80
Sri Lanka	3.30	3.00	4.60	2.40	-	4.80
Maldives	6.30	6.00	6.80	7.30	7.30	7.00

Source: Data World Bank, Macroeconomic and Monetary Developments, Quarterly Review of RBI, various issues, Economic Trends, Bangladesh Bank, June 2010 to September 2015

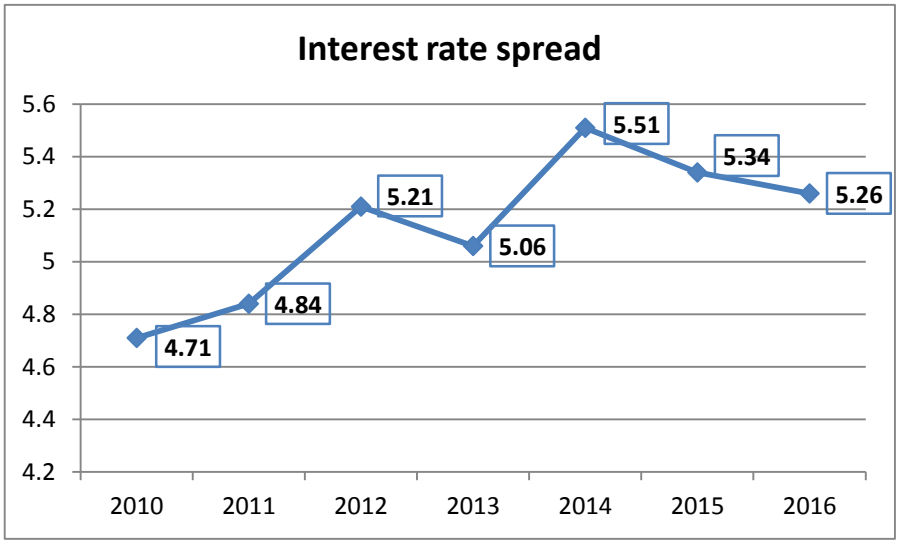
Financial Sector Reform Program (FSRP) was formed in 1990s to monitor IRS continuously and is reminding banks regularly to reduce IRS to a lower single digit in current years. Among the SAARC countries, Bangladesh experiences the highest IRS after Maldives and Bhutan. IRS is seen to be higher in FCBs (Foreign Commercial Bank) and PCBs (Private Commercial Bank) respectively. During previous 12 years, IRS was traced to be above 5% which discourages investment and overall money circulation in our economy. Moreover, IRS is a significant variable for commercial banks to monitor and control as these financial institutions operate through managing the received and invested funds. Any unpredictable insolvency and deficiency among commercial banks can lead to an overall financial crisis and economic recession (IMF, 2001).

Table 3: Yearly Interest Rate Spread in Bangladesh

End of period	Bank rate	Weighted Average Call Money		Scheduled Banks Weighted Average		Spread
		Borrowing	Lending	Deposits	Advances	
2019*	5.00	4.12	4.12			
2018	5.00	4.09	4.09			
2017	5.00	3.92	3.92			
2016	5.00	3.62	3.62	5.22	9.93	4.71
2015	5.00	3.69	3.69	6.34	11.18	4.84
2014	5.00	7.14	7.14	7.25	12.46	5.21
2013	5.00	7.78	7.78	8.39	13.45	5.06
2012	5.00	12.82	12.82	8.26	13.77	5.51
2011	5.00	11.16	11.16	7.46	12.80	5.34
2010	5.00	8.06	8.06	6.08	11.34	5.26
* Data up to month of January of year 2019.						

Source: Statistics Department, Bangladesh Bank

Trend of Interest Rate Spread in Bangladesh



3.2 Critical factors regarding determination of the level of interest rate

There are several key factors that determine the level of interest rates in an economy. The forces that drive the interest rates over the tears can be summarized below briefly in regard to the discussion about the key crucial forces:

Supply and demand of loanable funds:

An equivalent interest rate is admissible to both parties of the transaction (borrowers and lenders) and it is the rate at which the fund transaction is carried out (Rose *et al*, 1995). The supply of fund is reduced if the demand of fund increases and as a result the cost of fund (interest rate) will also increase. Scope for investing fund profitably, conditions for availing fund etc. contribute to change the preference for fund.

Inflation:

Inflation rate influences interest rate because it affects the value of money pledged to be transacted in future (Kohn, 2004). When inflation takes place, the disposable income goes higher causing to invest more as the supply of money is increased and market (nominal) interest rate is also expected to go higher. Real interest rate is measured as-

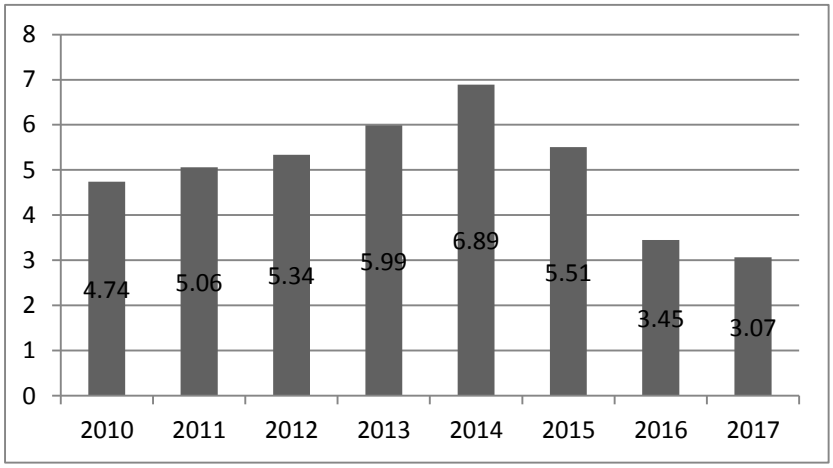
Real interest rate= nominal interest rate-expected inflation rate

It is because anticipation about contingent inflation definitely impacts market interest rate (kaufman, 1986).

Table 4: Change in Real Interest Rate in Bangladesh over the Years

Year	Value	Change
2010	4.74	-22.95%
2011	5.06	6.93%
2012	5.34	5.51%
2013	5.99	12.08%
2014	6.89	14.98%
2015	5.51	-19.94%
2016	3.45	-37.43%
2017	3.07	-11.03%

Real Interest Rates Changing Trend



Moreover, if expected inflation can be anticipated effectively, it can lead to make higher profit for commercial banks. So, inflation does influence interest rate changes in commercial banks and market as well.

Monetary Policy:

The central Bank of each country controls the level of credit and floating currency in an economy through monetary policy. Level of supply of fund, level of reserve, adjustment with inflation etc can be shaped by increasing or decreasing Bank Rate. But bank rate cannot always result into fluctuations of interest rate; other market forces can be responsible for this. Firstly, cash reserve and liquidity requirement in money market causes to change in repo rate and as a result, commercial banks attempt to adjust interest rate in line with the changing bank rate.

Policy Interest rate:

According to monetary policy H1FY 2019(Jan-June), Bangladesh Bank has decided to maintain the repo rate at 6 percent after lowering repo rate by 75 basis points to encourage investment and lessen liquidity pressures. Accelerating deposit growth in the last half of FY 2018 results into a stable reserve of liquidity. Credit demand has been balanced by reducing lending and deposit rates to 9.49 percent and 5.26 percent respectively. The real deposit rates tend to zero because of the given level of inflation. To ensure financial development, stable economic condition, investment mobilization, interest rate flexibility should be attained during the middle income transformation in Bangladesh. During this transition, Bangladesh has enhanced opportunities for investment and improved banks' operating efficiency through decreasing inflation which has been observed positively increasing the level of profitability compared to many high growth South and South-East Asian economies which can eventually accelerate national savings resulting into sustainable financial development.

Due to global interest rate hike and higher inflation rate, policy rates have been decided to remain unvaried. To deal with the NPL (Non-Performing Loan) crisis, FBCCI has proposed to reduce lending interest rates to single digit. On June 2018, private commercial banks decided to lower interest rate to 9 percent and deposit rate to 6 percent (limit set by Bangladesh Bank). But many of the banks could not execute their decision and now those banks' lending rate is between 14 percent and 15 percent whereas average deposit rate is between 9 percent and 10 percent because the profitability position of commercial banks is not in a growing

trend. Moreover, policy interest rates should be adjusted in an uninterrupted manner by governing economic and financial variables.

Competition:

By reducing deposit rate and raising lending rate can inflate commercial banks profit but the factor which limits this process is competition among those prevailing commercial banks within the banking industry of our country. Due to this fact, interest rates remain in a relevant range among all these financial institutions.

3.3 Determinants of Profitability of commercial banks in Bangladesh

The factors that affect commercial banks profitability should be analyzed and evaluated for the development of any financial system of an economy in which banking sector is the most dominating among all other sectors now-a-days.

Asset size:

The total asset size of a bank can positively affect its profitability up to a relevant range. Beyond that range it can affect profitability in the opposite manner.

Capital adequacy:

Capital adequacy refers to the state of having sufficient capital to operate and to invest in profitable sectors. Equity to Total Asset ratio is measured to represent the capital adequacy in a bank.

Asset quality:

Asset quality denotes to the utilization capacity of banking assets. A commercial bank's loan portfolio can be evaluated to assess the asset quality which affects the financial performance and profitability of banks. Hence, Loan to Total Asset, Non-performing Loan to Total Asset ratios are measured as the prime source of revenue is loans for commercial banks.

Deposits:

Banks collect funds through deposit. To inflate profit margin, a bank has to inflate interest margin too. Deposits can result into affecting positively a commercial bank's profitability only if it can be converted into loans which can increase the spread or interest margin.

Investment:

To comply with the minimal requirement for liquidity reserve with the Central Bank, commercial banks occupy investment into government securities, bonds, debentures, treasury bills etc. Therefore, in recent years several developing countries are attempting for financial system reform. Throughout these forms, commercial banks contribute actively by providing financing facilities for economic activities. Both domestic and external factors have accelerated the upturn of financial performance and profitability of commercial banks in latest two decades. Banking industry is that one industry which is mostly affected by macroeconomic variables.

3.4 Sampling

To represent the whole population, a convenient sample is taken that represents the overall characteristics that are common among population. To depict useful and effective data analysis, a sample of 30 listed commercial banks in DSE (Dhaka Stock Exchange) has been taken from the population of all the commercial banks operated in Bangladesh banking industry as financial institutions. The sample comprises of state owned, privately owned, foreign commercial banks. To establish the stated relationship, 5 years (2014-2018) cross sectional data have been extracted and evaluated.

3.5 Construction of Data Set

The dataset is constructed according to the need of the analysis and the availability of regarding data which is going to be assessed for research purpose. In this analysis, dataset has been divided into 2 specified categories.

Dependent Variable:

Dependent variable is that variable which is obtained by regression result and its variability depends upon the independent variable incorporated in that statistical model. As the value and degree of independent variable changes, the value of dependent variable is also shifted. In this analysis, the profitability is being considered to be dependent upon interest rate changes during the years. Therefore, ROE (Return on Equity), ROA (Return on Asset), NIM (Net Interest Margin) have been taken as dependent variables for reflecting profitability measures of commercial banks.

Independent Variable:

Independent variable is that variable which is involved in a model being independent of other variables. The variation in these variables causes to change the dependent variable; this variation can be assessed and explained by a selected model. Because of this characteristic of influencing other variables, independent variables are manipulated sometimes. In this analysis, Interest Rate Spread is taken as independent variable which impacts the profitability of commercial banks, three independent variables have been included i.e. Investment to Total Asset, Loan & Advance to Total Asset, Balance with other banks & financial institutions to Total Asset.

3.6 Measurement of Variables:

The formulas used to measure the variables are formulated in a precise and concise tabular format below

Table 5: Description and Measurement of Used Variables

Dependent Variable

Variables	Notation	Measurement
Return on Equity	ROE	ROE= Net Income/Total Shareholders' Equity
Return on Asset	ROA	ROA= Net Income/Total Asset
Net Interest Margin	NIM	(Interest Income-Interest Expense)/Total Earning Asset

Independent Variable

Variables	Notation	Measurement
Interest Rate Spread	IRS	Interest Rate Percentage on Loan-Interest Rate percentage on Deposit
Investment to Total Asset	ITA	Investment/Total asset
Loan & Advance to Total Asset	LTA	Loan & Advance/Total Asset
Balance with other banks & financial institutions to Total Asset	BWOB	Balance with other banks & financial institutions/Total Asset

3.7 Reliability and Validity of Data:

The data and variables used in this analysis have been extracted from authentic sources. The used data has been sited with proper reference of sources. Financial statements of 30 commercial banks for the period of 5 years (2014-2018) are the main source of secondary data. These annual reports have been received from the official websites of respective banks. Interest rate spread has been taken from monthly economic review published by Bangladesh Bank. Copyright has been entitled with these banks; validity and reliability of data is also involved with these banks being responsible for providing data as publicly accessible information.

3.8 Hypotheses:

The stated dependent and independent variables are fitted in a multiple linear regression model to reflect the relationship among these variables. Correlation has been carried out to represent the degree of dependency. Analysis of Variance (ANOVA) is also done to analyze the variation of independent variable. To explain the relationship between interest rate change and profitability of commercial banks, Gull and Zaman (2013) has used a framework. For relevancy purpose in this thesis work, this framework has been modified. The constructed hypotheses are given below:

H1: Return on equity of commercial banks in Bangladesh is significantly affected by interest rate spread, investment, loan and advances, balance with other banks

H2: Return on asset of commercial banks in Bangladesh is significantly affected by interest rate spread, investment, loan and advances, balance with other banks

H3: Net interest margin of commercial banks in Bangladesh is significantly affected by interest rate spread, investment, loan and advances, balance with other banks

The empirical models with the help of *statistical software SPSS* are represented below:

$ROA = \beta0 + \beta1IRS1 + \beta2ITA2 + \beta3LTA3 + \beta4BWOB4 + \mu$

$ROE = \beta0 + \beta1IRS1 + \beta2ITA2 + \beta3LTA3 + \beta4BWOB4 + \mu$

$NIM = \beta0 + \beta1IRS1 + \beta2ITA2 + \beta3LTA3 + \beta4BWOB4 + \mu$

4. Results and Discussion

4.1 Specification of the Model

$Yit = \beta0 + \beta1X1t + \beta2X2t + \beta3X3t + \beta4X4t + eit$

Where,

Y = Profitability measures (ROE, ROA, NIM) of commercial bank

β0 = Regression constant

X1t= Interest rate spread

X2t = Investment to Total Asset

X3t = Loan & advance to Total Asset

X4t = Balance with other banks to Total Asset

Eit= Random Error Term

β1, β2, β3 and β4 are the regression coefficients which denote how much the value of dependent variable is changed corresponding to the unit change in the independent variable. As the study has been conducted on sample basis and there may be threat of biased result. So, Random error term is incorporated in the regression equation. The regression constant indicates the level of dependent variable which will be derived if all the independent variable is zero.

Descriptive Statistics:

Table 6: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
IRS	145	1.56	10.12	4.9315	1.19964
ITA	145	.00	.77	.1429	.09646
LTA	145	.03	7.57	.7132	.58849
BWOB	145	.00	3.47	.0637	.28723
ROE	145	.00	.20	.1059	.04312
ROA	145	-.03	.13	.0085	.01184
NIM	145	-.27	.23	.0228	.03348
Valid N	145				

In table 5, the descriptive statistics briefly describes the measures of central tendency (mean, median), standard deviation, maximum and minimum values of the variables regarding a given data set of 30 listed commercial banks of Bangladesh. Commercial banks of Bangladesh have an average ROE equals to 10.59% and standard deviation equals to 4.31%. Average ROA and NIM are 8.5% and 2.28% respectively.

The standard deviation of ROA and NIM are correspondingly 1.18% and 3.35%. Maximum values of ROE are 20%, ROA is 13% and NIM is 23%. Average investment, loan & advance and balance with are banks ratios are regarded to be 14.29%, 71.32% and 6.37% of total asset. Standard deviation of investment, loan & advance and balance with are banks ratios are to be 9.65%, 58.8% and 28.7%.

Regression Analysis (ROE):

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.419[a]	.176	.152	.03971

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

Source: calculated from the annual reports of banks through statistical software SPSS

In this table, 17.6% variation in dependent variable ROE is explained by the independent variables or the fitted regression equation. Adjusted R square is 15.2% which considers only those independent variables that affect dependent variable.

Analysis of Variance:

Table 8: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.047	4	.012	7.468	.000[a]
	Residual	.221	140	.002		
	Total	.268	144			

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: ROE

Source: calculated from the annual reports of banks through statistical software SPSS

From the Analysis of Variance table 8, it is clear that Interest rate spread and other determinants have significant impact on commercial banks profitability based on ROE. Therefore, the used regression model is statistically significant for this analysis.

Multivariate Analysis

Table 9: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.050	.016		3.102	.002
	IRS	.013	.003	.373	4.841	.000
	ITA	-.019	.036	-.042	-.519	.605
	LTA	-.009	.006	-.124	-1.558	.122
	BWOB	-.020	.012	-.136	-1.735	.085

a. Dependent Variable: ROE

Source: calculated from the annual reports of banks through statistical software SPSS

The above table shows that IRS is statistically significant and it has positive impact on ROE. Other three variables are not statistically significant.

Regression Analysis (ROA):

Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.333[a]	.361	.285	.01132

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

36.1% of change in ROA is explained by independent variables in this fitted regression equation.

Analysis of Variance:

Table 11: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.002	4	.001	4.356	.002[a]
	Residual	.018	140	.000		
	Total	.020	144			

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: ROA

From table 11, it is showed that Interest rate spread and other determinants have significant impact on commercial banks profitability based on ROA.

Multivariate Analysis:

Table 12: Coefficients

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.004	.005		.815	.416
	IRS	.002	.001	.171	2.136	.034
	ITA	.003	.010	.022	.260	.796
	LTA	-.005	.002	-.256	-3.086	.002
	BWOB	-.004	.003	-.102	-1.257	.211

a. Dependent Variable: ROA

Here, IRS and LTA are statistically significant. Though IRS has positive impact but LTA has a negative impact on ROA.

Regression Analysis (NIM):

Table 13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.274[a]	.215	.148	.03266

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

In table 13, it is find that 21.5% of total variation in NIM is explained by incorporated independent variables of this regression model.

Analysis of Variance:

Table 14: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.012	4	.003	2.831	.027[a]
	Residual	.149	140	.001		
	Total	.161	144			

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: NIM

From table 14, It can be expressed that Interest rate spread and other determinants have significant impact on commercial banks profitability based on NIM.

Multivariate Analysis:

Table 15: Coefficients

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.016	.013		1.218	.225
	IRS	.005	.002	.163	2.003	.047
	ITA	-.068	.029	-.196	-2.311	.022
	LTA	-.008	.005	-.136	-1.610	.110
	BWOB	-.011	.010	-.094	-1.128	.261

a. Dependent Variable: NIM

In this table 15, IRS and ITA are statistically significant. IRS has positive effect and ITA has negative effect on NIM.

Correlations between Variables:

Table 16: Correlations

		IRS	ROE	ITA	LTA	BWOB	ROA	NIM
IRS	Pearson Correlation	1	.384**	.023	-.070	-.031	.192*	.171*
	Sig. (2-tailed)		.000	.779	.405	.712	.020	.040
	N	145	145	145	145	145	145	145
ROE	Pearson Correlation	.384**	1	.015	-.126	-.129	.483**	.283**
	Sig. (2-tailed)	.000		.862	.130	.123	.000	.001
	N	145	145	145	145	145	145	145
ITA	Pearson Correlation	.023	.015	1	-.233**	-.135	.099	-.148
	Sig. (2-tailed)	.779	.862		.005	.107	.236	.076
	N	145	145	145	145	145	145	145
LTA	Pearson Correlation	-.070	-.126	-.233**	1	-.106	-.262**	-.092
	Sig. (2-tailed)	.405	.130	.005		.205	.001	.271
	N	145	145	145	145	145	145	145

BWOB	Pearson Correlation	-.031	-.129	-.135	-.106	1	-.083	-.058
	Sig. (2-tailed)	.712	.123	.107	.205		.320	.490
	N	145	145	145	145	145	145	145
ROA	Pearson Correlation	.192*	.483**	.099	-.262**	-.083	1	.089
	Sig. (2-tailed)	.020	.000	.236	.001	.320		.289
	N	145	145	145	145	145	145	145
NIM	Pearson Correlation	.171*	.283**	-.148	-.092	-.058	.089	1
	Sig. (2-tailed)	.040	.001	.076	.271	.490	.289	
	N	145	145	145	145	145	145	145

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In table 16, IRS is positively correlated with ROE, ROA and NIM. If ROE, ROA or NIM increases; IRS will also increase. ROE is positively correlated with IRS, ROA and NIM. If IRS, ROA or NIM increases; ROE will also increase. ITA is negatively correlated with LTA. LTA is negatively correlated with ITA, ROA. ROA is positively correlated with IRS and ROE whereas negatively correlated with LTA. NIM is positively correlated with IRS and ROE.

DW (Durbin-Watson) test: (ROE)

Table 17: Model Summary

Model	R	R Square	Adjusted R	Std. Error of the	Durbin-Watson
1	.419[a]	.176	.152	.03971	1.505

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: ROE

If the result of this test is observed to be between 1.5 and 2.5, there is no problem of auto correlation. Here, the result is 1.5, so there is no problem of auto correlation.

DW (Durbin-Watson) test: (ROA)

Table 18: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.333[a]	.111	.085	.01132	1.968

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: ROA

If the result of this test is observed to be between 1.5 and 2.5, there is no problem of auto correlation. Here, the result is 1.97 which is tends to 2.0. So there is no problem of auto correlation.

DW (Durbin-Watson) test: (NIM)

Table 19: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.274[a]	.075	.048	.03266	1.890

a. Predictors: (Constant), BWOB, IRS, LTA, ITA

b. Dependent Variable: NIM

From table 19, if the result of this test is observed to be between 1.5 and 2.5, there is no problem of auto correlation. Here, the result is 1.9, so there is no problem of auto correlation.

Multicollinearity Test:

Table 20: Coefficients

Model		Collinearity Statistics	
		Tolerance	VIF
1	IRS	.994	1.006
	ITA	.920	1.087
	LTA	.922	1.085
	BWOB	.961	1.041

a. Dependent Variable: ROE

One of the assumptions of Linear regression model is there is no perfect collinearity among independent variables themselves. Here, it should be noted that if the result of the test is less than 3 then independent variables are independent of each other. If result is 5, there is very likely that independent variables are correlated to each other. If the result is 10, there definitely exists the problem of multicollinearity. In this test, there is no problem of multicollinearity.

4.2 Discussion

4.2.1 Discussion of Findings

By incorporating the statistical analysis and established regression equation the outcome of the findings can be depicted as:

ROE= 0.050 + (0.013*IRS) + (-0.019*ITA) + (-0.009*LTA) + (-0.020*BWOB)

ROA= 0.004 + (0.002*IRS) + (0.003*ITA) + (-0.005*LTA) + (-0.004*BWOB)

NIM= 0.016 + (0.005*IRS) + (-0.068*ITA) + (-0.008*LTA) + (-0.011*BWOB)

From above three regression equation, it can be extracted that Interest Rate Spread has positive impact on the profitability of commercial banks. Above models confirm that IRS has a positive association with commercial bank's profitability in Bangladesh. The results are seemed to be consistent with the developed hypotheses of this study and other studies conducted by several countries around the world which predict that IRS is positively associated with commercial bank's profitability. This can be happened as the higher lending rates increase banks' revenues. It also implies that demand for loan is inelastic and less responsive to the interest rate changes. Therefore, Bangladesh Bank needs to exert monitoring roles with due sincerity. To achieve higher level of profitability, the sources of revenues should be diversified as IRS has a minimum influence on the profitability.

5. Conclusion

The purpose of the study was to analyze the association between interest rate changes and its impact on commercial banks profitability based on the context of Bangladesh. Interest rate fluctuation is expected to impact the financial performance of commercial banks which play a vital role of intermediaries to allocate economic resources for circulating fund from depositors to investors. The study shows that interest rate change has significant impact on commercial banks profitability. Though it is difficult to establish the direction of the relationship between interest rate changes and profitability, this study represents that there is a positive relation between interest rate spread and profitability of commercial banks. In

Bangladesh, a general trend of high interest rate spread has been seen to prevail. The results can be interpreted within the concept of Loanable Funds Theory which implies that as the demand of fund far exceeds the supply of fund; banks can continue charging higher lending interest rates. To cover operational cost and to improve profitability, banks inflate interest rate and interest rate spread is also increased. To encourage investors interest rate spread should be lowered. Execution of policies for providing sufficient credit facilities can make banks reduce interest rates. On the other hand to improve profitability, interest margin and spread should be higher. Therefore, there should be a proper policy to maintain a balance between these two interest rates considering the overall economic growth and development.

5.1 Limitations of the study

The purpose of this study is to establish and define a relationship between interest rate fluctuations and its impact on profitability of commercial banks of Bangladesh. 30 listed commercial banks have been taken as sample for the study. Based on the availability of data, analysis of 5 years' time period has been conducted. Some abridgements related to the study are:

First, sample of commercial listed banks from total population has been taken for the convenience of the study; there may be any sort of bias while selecting those sample banks. Secondary data has been extracted from respective company websites assuming that the data are reliable and usable for this study purpose. Second, there are many macro-economic variables which define the interest rate more practically, but for want of availability of information those variables have not been incorporated. Third, measurement of profitability can be explained through many other determinants other than ROE, ROA and NIM. Other factors that may affect financial performance of commercial banks have not been considered Fourth, Contextual research paper regarding Bangladesh scenario are insufficient to access and to analyze; complexity regarding prior knowledge has been taken place. And only quantitative variables have been incorporated in this study; qualitative factors have not been considered in the analysis. Lastly, unavailability of data related to interest rate spread caused narrowing the analyzing time period into only five years which cannot reflect the long term fluctuation and its impact on profitability.

5.2 Areas for Further Research

There are several issues that can be assessed and explored further in the regard of the stated topic. The study has been conducted based on Bangladesh perspective. To generalize the findings, many other countries scenario can be analyzed simultaneously in the essence of international comparative analysis among various countries throughout the world. A study can be done to work with the developed countries and developing countries separately. In further study, other financial institutions such as microfinance institutions can be brought under consideration. Besides dependent and independent variables, some control variables and non-financial factors (bank size, ownership structure, inflation rate, number of customers etc.) that represent the bank characteristics and macroeconomic condition may be incorporated. Research can be done by including more variables as determinants of profitability and interest rate change.

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