

Trends and Determinants of Bank Profitability: Empirical Evidence from Commercial Banks of Bangladesh

A dissertation submitted to the Department of Banking and Insurance, University of Dhaka, Bangladesh in partial fulfillment of the requirements for the degree of Doctor of Philosophy (PhD)

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**Trends and Determinants of Bank Profitability: Empirical
Evidence from Commercial Banks of Bangladesh**

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May, 2021

Dedicated to My Parents, Siblings,
Mumtaheena Binte Ahmed, Mustaeen Ahmed Bhuiyan
And
Dr. Mohiuddin Ahmed Bhuiyan

Declaration

I, Rana-Al-Mosharrafa, hereby declare to submit the dissertation titled “Trends and Determinants of Bank Profitability: Empirical Evidence from Commercial Banks of Bangladesh” to the Department of Banking and Insurance, Faculty of Business Studies, University of Dhaka in partial fulfillment of the requirements for the degree of Doctor of Philosophy (PhD). This work or any part thereof has not been submitted anywhere for any other degree.

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DECLARATION FROM SUPERVISOR

This is to certify that Rana-Al-Mosharrafa has successfully conducted her thesis work entitled with “Trends and Determinants of Bank Profitability: Empirical Evidence from Commercial Banks of Bangladesh” under my supervision for the degree Doctor of Philosophy in the Department of Banking and Insurance, Faculty of Business Studies, University of Dhaka in partial fulfillment of the requirements for the degree of Doctor of Philosophy (PhD). This work or any part of it has not been submitted anywhere for any other degree.

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Abstract

The study presents the trends and determinants of bank profitability with the empirical evidence from commercial banks of Bangladesh. The banking sector is the prime driving force and pillar for accelerating economic growth of modern economics. But, it is less stable in developing countries than in developed countries. A sound banking sector provides a base for stabilizing financial system to accomplish earnings for developing economy. To maintain financial stability in an economy and to defend any negative shocks, it is badly needed to identify the significant determinants which have mostly influence on bank profitability. Profitability can be defined as the capability to generate profit. It is the primary goal of all business venture. In bank business assessing present and past profitability and projecting upcoming profitability is very important. Some commercial banks are renowned for their profitability but some other banks deteriorated, this poses queries about some factors that will be dominated by the bank management to determine their profitability. At the same time we need to know about the extent of common determinants of bank profitability of Bangladesh.

Almost 96% of total assets of the monetary sector are accounted in the banking industry in Bangladesh. Banks functioning in a concentrated market have some market control and might be more cautious in risk-taking which may enhance profits, either by higher interest rate or less loan loss provision. The traditional SCP theory advises that market structure influences the competitive conduct of banks which further affects the bank profitability. This is because extremely concentrated banking structure encourages banks to plan with each other to produce more profit. Types of bank, efficiency and ownership structure also have an important issue against the

inclination of bank profitability. Credit and liquidity risk management, efficiency of the personnel, business diversification, market concentration/competition, good governance and the economic growth may have impact on bank profitability.

Global deregulation and technological progression made an indentation of challenge in bank business. Now a days, banks are engaged in diversified trading activities such as transfer of fund, credit mechanisms etc. which may have an impact on its profitability. As a service oriented business, banks are also highly regulated by the supervisory authority in an economy.

We consider driving determinants of bank profitability in Bangladesh, assessing the impact of competition and concentration on banking profit and the effect of capital conservation buffer on bank profitability based on the panel evidence from commercial banks in Bangladesh. We studied the impact of capital conservation buffer because banks in Bangladesh are practicing Basel III accord where additional capital conservation buffer was enacted. Another theoretical motivation to investigate the impact of competition and concentration on profitability, as new banks are coming and we found bank market is moderately concentrated with low level of competition. Therefore we are inquisitive to study the scope for rising competitiveness by averting disproportionate concentration which have an impact on bank profitability.

In chapter one, we confer the motivation and the extensive review of literature concerning our research. As the profitability of bank business in Bangladesh is not static and it is a lion share of the Bangladesh economy, it inspired us to investigate the determinants of bank profitability. Banks are trying to earn more profit to get a place in the financial market. Adequate level of profit is required to absorb any shocks and to conquer firmness of the financial system. With the vision of testing the economic

theories concerning to the bank profitability theoretically encourages us to perform the present study with some empirical evidence in Bangladesh.

In chapter two, we empirically analyzed the impact of managerial and macroeconomic issues which drive profitability of 57 commercial banks in Bangladesh from 2007 to 2017 by the use of GMM estimator. We considered bank-specific, industry specific and macroeconomics factors to determine the significant determinants of bank profitability. Profitability of banks is proxied by return on asset (ROA), return on equity (ROE) and net interest margin (NIM). Our empirical result shows that cost efficiency has significant impact on the measures of profitability which can be improved by dropping undesirable working expenses. Total loan to deposit ratio is positively and significantly associated with profitability (ROA and ROE), suggesting that efficient fund management including investment and assessed expenditure should be emphasized. Liquidity and profitability are significantly negatively correlated while profitability measured in terms of ROA. Bank size has significant negative influence on all the measures of profitability, indicating that growth in bank size is significantly negative impact on profitability due to monopolistic competition. Credit risk significantly positively affects ROE meaning that, due to economical uptrend, financially insolvent borrowers are taking loan for investment which will motivate them to honor debt. As a result, profitability will increase from speeding up net interest margin. Again, positive association with NIM indicates core business activity which influences profitability of banks in Bangladesh. Among macroeconomic variables, inflation affects negatively and economic growth rate has positive influence on ROA and significant positive impact on NIM but inverse relationship is found with ROE. Bank spread has positive relationship with the profitability measured in ROA and NIM but significantly negative with ROE of Banks in Bangladesh.

In chapter three we studied the impact of competition and concentration on the profitability of commercial banks in Bangladesh for a period of 2007 to 2017 by the use of panel data of 57 commercial banks functioning in Bangladesh. In traditional structure conduct performance (SCP) hypothesis, market structure influences the competitive behavior of the market participants which promote the profitability of banks. This study supported SCP hypothesis and found that profitability in the banking arena in Bangladesh is moderately concentrated. We assessed competition and concentration by Herfindahl-Hirschman Index (HHI) which has a positive relationship with bank profitability. It reveals that concentration drops the cost of collusion between banks and generates greater profit for all market participants. We found evidence that employee productivity have significant positive association to banking profits, whereas expense management, liquidity position, bank size and marginal costs are significantly negatively affect bank profitability. Profit variable i.e. ROA responds positively to GDP growth and bank spread, but inversely associated with inflation.

In chapter four we examined the co-movement of buffer capital contemplating the Basel III accord and profitability in the banking industry in Bangladesh. We considered bank-specific, industry specific and macroeconomic issues of 57 commercial banks for the period of 2007-2018. To improve the quality of regulatory capital, significant improvement in financial stability and proper treatment of liquidity risk Basel III accord emerged in 2010 with new capital and liquidity regulations to safeguard the banking sector both in stressed situation and profitable situation. In our study, profitability was proxied by return on assets (ROA), return on equity (ROE) and net interest margin (NIM). We observed procyclical behavior of buffer capital in relative term with ROA, and significant

counter cyclical influence of regulatory buffer capital on ROE and NIM. Internal capital generation rate has a strong significant impact on the proxy variables of profitability measured by NIM. Bank size has a significant positive influence on ROE due to employ monopolistic power to generate profit. Tier I leverage is positively related with ROE and NIM.

Our present study on the driving determinants of the bank profitability, impact of competition and concentration on banking profit and the impact of capital conservation buffer considering the Basel III accord on bank profitability will provide an early prediction of the growth and profitability of banks in Bangladesh. This study make an arrangement to implement urgent measures while its threat is not yet full-fledged. Our findings also provide a scope to raise competitiveness by averting disproportionate concentration as well as enrich the literature with direct inferences for community strategy towards banking-structure and principles.

Comparative study can be performed in different dimensions by the forthcoming researchers like between private banks and state owned banks comparison, traditional banks and Islamic banks comparison etc. Other explanatory variables like corporate governance, corporate social responsibility(CSR), corporate tax rate, and deposit insurance can be considered to accelerate the model. Extended time adjustment analysis can be accomplished to magnify the profitability of banks in Bangladesh by the future researchers.

Relevance of the Research Work to Bangladesh

For the empirical purpose we considered Bangladeshi commercial banks in our study for some reasons. Firstly, Bangladesh is a developing country which has been independent in 1971. Just after liberation, there were only 4 state owned commercial banks in Bangladesh. From then up to 2017 there are 58 banks established in Bangladesh. Among them some banks are very newly established and some are upcoming as bank industry has become potential business of the country. In this perspective, we strongly believe that the result of our study is definitely new compared to other previous studies and at the same time the results of this study can guide the future researchers who will work with even higher number of banks.

Secondly, the research outcome of this study established that all the factors of our study are relevant which inferred that some of the bank-specific factors possess some substantial effects on bank profitability in Bangladesh. Our empirical result shows that cost efficiency, liquidity position, credit risk, bank size, employee productivity and marginal cost have highly significant impact on the measures of profitability.

Thirdly, Regulations on capital conservation buffer recommended by Basel III accord have a great impact to defend the banking system in Bangladesh. Bank profitability is significantly correlated with buffer capital in relative terms, internal capital generation rate, regulatory buffer capital, and tier1 leverage. At the end, in the earlier and existing literature, we found many studies regarding the determinants of bank profitability, but as an emerging economy where 80% of the people of world population are living and 59% of the world GDP is produced, study on Bangladeshi commercial banks is a distinctive addition to the banking literature. Along with this, it is a valuable addition to the dispute about the pro-cyclicality of the new capital accord.

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List of Acronyms

GMM	Generalized Method of Moments
NIM	Net Interest Margin
GDP	Gross Domestic Product
ROA	Return On Asset
ROE	Return On Equity
BCBS	Basel Committee on Bank Supervision
PCB	Private Commercial Banks
GCC	Gulf Cooperation Council
POLS	Pooled Ordinary Least Square
FE	Fixed Effect
RE	Random Effect
NPL	Non-Performing Loan
SCP	Structure Conduct Performance
VIF	Variance Inflation Factor
CSR	Corporate Social Responsibility
ESH	Efficient Structure Hypothesis
RMP	Relative Market Power
HHI	Herfindahl-Hirschman Index
CCoB	Capital Conservation Buffer
CET	Common Equity Tier
BB	Bangladesh Bank

Chapter One

Introduction

1.1 Motivation for the research

As an essential institutional and functional vehicle, the banking system plays a vital role for the transformation of the economy. Banks can be defined as a type of business where deposits are taken into consideration as liabilities and issuing debt securities are treated as assets (Fama, 1980). This industry is one of the most knowledge-intensive industry and going through innovations not only in terms of technology but also in terms of service delivery process. In Bangladesh, banks are playing as an intermediary role in transferring funds from lenders to borrowers, by which it generates a higher welfare to the society, perhaps at lesser costs.

The banking system is the utmost significant element of the financial system in Bangladesh. In 2013, banking sector assets contains 63% of the total assets of the formal financial sector (Mansur, 2015). Bangladesh Bank, the central bank of Bangladesh, is the supervisory authority to oversee the activities of scheduled banks and financial institutions in Bangladesh. At the end of 2017, the status of the banking sector has been shown in table 1.1.

Table 1.1: Bank structure of Bangladesh in 2017

Types of Banks				
Schedule Bank (58)				Non-schedule Bank
State Owned Commercial Banks	Private Commercial Banks	Specialized Banks	Foreign Banks	
6	40	3	9	5

Source: Financial System of Banks & FIs, Bangladesh Bank.

For the last few years, Banking sector of Bangladesh showing uneven financial performance in their business. Bangladesh Bank has been taken up a series of initiatives to develop the strength, competitiveness, and efficacy of the banking system. Variations concerning to ownership, market concentration, regulatory measures and strategies have taking place among them. For assessing the capital adequacy of the bank, Bangladesh Bank issued Basel I, II and III guidelines in 1996, 2010 and 2015 respectively in order to stabilize the financial system and build reliance of its clients.

In bank business, determining present and past profitability and predicting future profitability are imperative. Skillful behavior and sustainable performance are the hypes for reaping competitive advantage of today's organizations. To defend any undesirable shocks, it is badly required to identify the significant issues which have mostly influence on bank profitability.

As specified in the above background, we performed our study regarding the profitability determinants of Bangladeshi commercial banks relating to the market structure as well as the implementation of Basel III accord with the subsequent objectives in mind:

- Though the adoption of financial sector reform program, due to rapid deregulation in the financial market, introducing new technologies, aggressive competition, globalization and customer demand fluctuation, both business strength and performance of private and state-owned commercial banks are quite deprived. Therefore, banks must identify the driving determinants of the profitability, impact of competition and the effect of capital conservation buffer to make the business profitable.
- This research effort is made to ascertain the factors that lead to impactful managerial factors to boost up profitability of the banks and also contribute academia through providing empirical evidence regarding profitability in an emerging economy.
- For empirical study, we consider the population of 57 commercial banks in Bangladesh over a recent period from 2007 to 2017, to provide more appropriate and recent empirical evidence.
- In a progressive economy, concentrated banking system enhanced competitive operation. Efficient banks could improve their performance through competition and the opposite scenario is experienced for inefficient banks. Thus, our intention was to explore the status of competition and concentration in the banking arena in Bangladesh and its influence on bank profitability.
- Preserving minimum capital requirement is a control mechanism to decide the capital structure and the performance of a bank. In order to develop the quality of regulatory capital, to improve financial steadiness and proper treatment of liquidity risk Basel III was introduced in 2010 with new capital and liquidity regulations. Bangladesh started to implement this regulation in 2015. Thus,

our motive was to investigate whether the Bangladeshi commercial banks' capital buffers are sensitive to alterations in capital regulation consistent with the Basel III accord and to assess whether the incorporated changes in bank capital buffers affects the profitability of banks. Along with this, by providing some empirical evidence, our study is a valuable addition to the dispute about the pro-cyclicality of the new capital accord.

1.2 Literature review

Being a comprehensive and stable banking industry in Bangladesh has played a crucial role for the country's economic growth and progress in the last decade. In the framework of banking industry of Bangladesh, a substantial number of studies have been accomplished by considering both bank-specific and macroeconomic factors. Those studies have been done to analyze the determinants of bank profitability by using Generalized Method of Momentum (GMM), fixed and random effect methods. In a study of 35 European commercial banks, Menicucci and Paolucci (2016) identified significant positive relationship of bank size and capitalization with profitability. Sufian and Habibullah (2009a) investigated the influential factors of Bangladeshi bank profitability of their study and observed that credit risk was positively associated while noninterest income was negatively correlated with the profitability of banks.

Using NIM as a proxy variable of profitability by using GMM estimation, Saona (2016) performed a study over 156 banks of Latin American countries. He experienced that among bank specific variables size, loan loss ratio, loan to asset ratio are positively and significantly correlated to the profitability though GDP growth rate has negative influence on NIM.

Gilbert (1984), Berger and Hannan (1998) stated that banks' profit is a function of industry structure. In the highly concentrated market, banks are likely to generate sophisticated profits owing to their increased capability to earn monopoly rents through collusion. Short (1979) Observed that the ownership structure, industry composition, monetary policy, interest rate in addition to asset growth significantly influence banking profit.

Islam and Nishiyama (2016) conducted a study over 259 commercial banks in South Asian countries for a period of 1997 to 2012. They found that equity level and recurring earning power affect positively on a bank's profitability. At the same time, liquidity position, funding gap, cost of fund as well as productivity ratio negatively and significantly influence the profitability of a bank.

Sun et al. (2017) accomplished a study on 16 OIC countries considering 105 banks over the period 14 years and observed a positive consequence of credit quality, deposit to asset ratio, capital adequacy, and diversification, as well as negative impact of equity to total assets and management efficiency on bank profitability. Berger and Hannan (1989) revealed that extremely concentrated markets have charge greater overhead expenditure, higher rates on loans and lower rates on deposits compare to less concentrated markets and make more profit. Bougatef (2017) conducted a research study of the banks in Tunisia regarding the determinants of bank profitability. He experienced that capitalization and liquidity have a positive association with profitability, while corruption has a negative and insignificant impact on ROE but positively correlated with ROA. According to Ahamed (2017), higher segment of non-interest income produced higher profits when banks are engaged in more trading activities in India.

Performing a research study over 73 UK commercial banks for a period of 2006 to 2012 Saeed (2014) mentioned that variables of profitability are positively associated with capital ratio, loan outstanding, liquidity, volume of deposit, and interest rate. According to Samad (2015), loan to deposit ratio, capital risk and credit risk affect significantly to the financial performance of Bangladeshi banks. He observed this impact by performing a research study of 16 transition economies of 42 commercial banks in Bangladesh.

Considering the period of 2006 to 2013 Rahman et al. (2018) performed a study over 25 commercial banks to identify the significant determinants of bank profitability. He measured profitability by return on assets (ROA), net interest margin (NIM) and return on equity (ROE) and found that both regulatory and equity capital and loan intensity have significant positive relationship with profitability but cost efficiency and off-balance sheet activities have negative influence on profitability of banks.

Beck et al. (2006) a study of 69 countries was conducted by focusing that cross – country analysis indicated an optimistic association between competition and constancy in the banking system which will enhance profitability at the end.

To construct the econometric model for our study we guided by the reduced form equation approach instead of structural form approach to analyze the driving determinants of bank profitability, impact of market structure and the effect of capital conservation buffer on the profitability of banks in Bangladesh. According to Morlan (1981) reduced form equation approach is relatively simple in terms of data requirement for producing robust estimator and for summarizing the effects either directly or indirectly. Conversely, reduced form equation can assess the coefficients of the variables which is also difficult to interpretation economically.

Again, we estimated our regression equation by single equation approach in lieu of system equation approach. Because in system equation approach, if any equation is not correctly specified it will influence other equations which will produce inconsistent estimation. Anderson and Rubin (1949) pointed out that single equation approach is a rational choice to attain consistent estimate of the coefficients of a definite equation.

There is a probability to induce endogeneity problem when condensed form and single equation approach is used. Regarding this problem i) we introduced instrumental variables estimation in our panel data approach which consistently calculate time-varying coefficients accompanied with unobserved effects and endogeneity in the regressors (Wooldridge, 1995) aimed at the econometric models of bank profitability and ii) we used fixed effect model by considering that the endogenous regressors are stationary.

Our study contributes to the literature as follows:

- We studied the panel data of 57 commercial banks in Bangladesh comprising the period of 2007 to 2017 which is seemingly large and contemporary to provide recent empirical evidence to determine the significant determinants of Bangladeshi commercial banks.
- In the earlier literatures we observed that numerous researches were conducted to identify the profitability of banks by considering either bank-specific or industry-specific or macroeconomic variables. Nevertheless, we performed our study with the consideration of these three types of variables using linear regression model. In this context, our studies vary from the previous empirical literatures.

- Our research work provides competitive advantage of implementing Basel III accord by providing capital conservative buffer to reduce the procyclicality in the banking sector in Bangladesh. Concerning this issue, study on an emerging economy like Bangladesh will provide a valuable addition to the Banking literature.

1.3 Core findings of the research

Deposit collection and lending is the customary of bank business. Keeping in mind with the long run strategy of risk bearing capacity and capital adequacy, the bank always try to optimize its goal to attain higher profit. To oversee the financial soundness indicators and to detect the potential bank specific and macroeconomic determinants of bank profitability considering the regulatory changes according to Basel III accord in commercial banks in Bangladesh we studied the impactful determinants of bank profitability. We have taken into consideration the three measures of profitability in our study – ROA, ROE and NIM. We experienced wide range of discrepancy across different measures of profitability in banks.

In chapter two, we analyzed the driving determinants of bank profitability in Bangladesh. In our empirical research, we perceived that cost efficiency ratio, liquidity position, and bank size have significant negative influence on bank profitability. However, credit risk has significant positive impact on ROE and loan to deposit ratio affect significantly positively on ROA and inversely influenced on ROE and NIM.

In chapter Three, we tried to explore the determinants of bank profitability aligned to the structure conduct performance hypothesis established by Bain (1956). The study

reveals that the banking sector in Bangladesh is moderately competitive and concentrated but statistically insignificant to enhance profitability of banks. We also found that expense management, employee productivity, marginal cost, liquidity position and bank size affect significantly on ROA of the bank.

Chapter Four, investigates the impact of capital conservation buffer as recommended by Basel III on bank profitability in Bangladesh. Significant counter cyclical impact was observed between the regulatory buffer capital and the profitability of banks. Internal capital generation rate has a strong significant negative impact on NIM but positive impact with ROA and ROE. This positive relationship implies that, bank should attempt to generate more core capital to remain the profitability trend positive and to absorb any financial shock in the economy. Bank size also significantly positively related with ROE. Financial intermediation, non-performing loan and implicit cost have significant positive association with ROE, NIM and ROA respectively.

Chapter Two

Driving Factors of Bank Profitability: A Panel Data Analysis of Commercial Banks of Bangladesh

2.1 Introduction

As an essential institutional and serviceable unit, the progressive banking system plays a substantial role for the transformation of the economy. But, for the developing countries banking sector is less stable compared to the developed countries (Sufian and Habibulla, 2009a). There are several economic and institutional features that make Bangladesh a unique setting for studying the impact of internal matters on bank profitability.

Profitability is the capacity of a business to earn profit. In bank business determining present and past profitability and projecting upcoming profitability is very imperative. A sound banking sector provides a base for stabilizing financial system to accomplish earnings for developing economy. Some commercial banks are renowned for their profitability but some other banks are not performing well, this poses questions about some factors which will be dominated by the bank management to determine their profitability. In line with this dispute, we are trying to detect the extent of common determinants of bank profitability in the context of Bangladesh.

A steadfast and competent banking system is able to provide substantial profit, can offer excellent quality of facility to the clients and can accumulate adequate fund to give loan to borrowers. In micro level, banks try to earn enough profit to acquire a place in times of upward competition in the financial market. At macro level,

sufficient profit is required to absorb any undesirable shocks and to remain stable in the financial system. Basel Committee on Bank Supervision (BCBS, 2006) indicates that operational risk of any bank lead to failure in internal process, people and system management. However, skillful behavior and sustainable performance are the hypes for reaping competitive advantage of today's organizations. In the banking industry of Bangladesh, bank characteristics resembling inefficient cost management, liquidity position, size of the bank, management of overhead expenses, capital adequacy, non-performing loan status, intermediation role of banks, and macroeconomic variables like, market concentration, inflation and economic growth may have effect on bank profitability.

This research effort is therefore made to identify impactful bank-specific and macroeconomic issues to boost up profitability of the banks, along with contributing to academia through adding empirical evidences from the commercial banks of Bangladesh.

The banking system of Bangladesh is a combination of private, public, foreign, specialized and cooperative banks. New banks are now relentlessly fighting for their survival in the competitive market. The business activities of the private commercial banks (PCBs) increased in a considerable number and have occupied a lion share in the bank business, revealed in assets growth, deposits mobilization and credit disbursement. Consequently, profitability declined gradually during the last several years. This makes sense to analyze the factors to be responsible to determine bank profitability.

2.2 Profitability of bank: Literature review

Like other service industries, by providing superior service quality, giving better endorsements, and building customer loyalty banks are trying to enhance customer satisfaction. The banking industry has reformed tremendously owing to rapid deregulation in the financial market, introducing new technologies, aggressive competition, globalization and customer demand fluctuation.

Profitability is a symbol to demonstrate the performance of the financial system of banking sector as well as the economy of a country as a whole. Numerous investigators from different nations have explored the influence of macroeconomics and bank-specific issues on bank profitability. Weerasainghe and Perera (2013) performed a study in Sri Lanka, where they showed that profit of the banking sector is enhanced by a favorable macroeconomic environment. Dietrich and Wanzenried (2011) performed a research work on 372 commercial banks in Switzerland during 1999 to 2009 in which they took into account both in pre-crisis and post-crisis period of 1999-2006 and 2007-2009 respectively. They took averages of ROE, ROA and NIM of the banks as profitability measure. In their study, they showed that highly skilled banks can produce more profit than less competent one; loan growth and diversification affect positively on profitability and funding cost affect negatively to capture profit. Hosen (2020) performed a study in Bangladesh on 23 commercial banks and found that banks' internal factors like interest rate spread, capital adequacy ratio, credit risk, deposit growth, loan to deposit ratio, cost to income ratio and size of the bank significantly affect profitability of banks measured in terms of ROA and ROE. Flamini et al. (2009) and Athanasoglou et al. (2006) exerted bank specific factors like operating expenses, asset quality, management efficiency, bank size, capital adequacy and liquidity as internal factors and GDP, inflation, money supply

and interest rate as external factors in their studies. They claimed that internal factors can be regulated by the management of the banks and changes of these factors may create business risk. Again, external factors cannot be restrained by the bank management and create systematic risk. Both types of risks have a strong influence on the profitability of bank. Edwards (1977) revealed that banks with large number of employees, greater expenditure on wages enjoy monopoly power to generate profit. He argued that expense-preference model is a valuable framework than profit maximization model to make profit. According to Williamson (1963), Rees (1974) and Becker (1957), managers may raise staff expenditure; managerial remunerations and discretionary income that have a helpful impact on profitability. They also observed that 'expense-preference theory' received a substantial attention to maximize the utility of the firm by pursuing non-profit maximizing policies which will engender profit in the long run. Alper and Anbar (2011) conducted a study with 10 listed commercial banks in Turkey for a span of 2002 to 2010 by considering some bank-specific variables and macroeconomic variables. They showed that asset size of the bank influenced positively on ROE and non-interest income to total asset ratio affect negatively on ROA. Rahaman and Akhter (2015) accomplished a study in Bangladesh for a period of 2009 to 2013 with some selected bank specific variables on Islamic bank profitability. They revealed that size and deposits of the bank have substantial negative influence on ROA. Abdullahi and Usman (2017) furnished a study in Nigeria where they found that equity to total asset ratio and credit risk management have a significant effect on the efficacy of the bank which was determined in terms of ROA and ROE. White (1976) performed a study by using profit-maximizing, non-price competition model and found that banks incur higher cost in more competitive atmosphere than other banks which exists in less competitive

environment. Sufian and Habibullah (2009b) performed a study regarding the profitability of banks in China for a duration of 2000 to 2005 by considering joint stock commercial banks, state owned commercial banks and city commercial banks. They found that liquidity, capitalization and credit risk is positively related with the profitability of state-owned commercial banks. Cost influenced negatively on profitability of joint stock commercial banks and city commercial banks. In case of macroeconomic variables diversifications along with economic growth affect positively and money supply growth affect negatively on the profitability of state owned and city commercial banks in China.

Sufian (2011) investigated the impact of bank specific factors and macroeconomic factors on the profitability of Korean banks considering the period of 1992 to 2003. He performed regression analysis to identify the significant variables that have a great consequence on bank profitability. He found that liquidity, credit risk and inflation had negative influence on profitability whereas diversification and size of the bank had positive effect on the profitability of Korean banks. Athanasoglou et al. (2006) examined that except liquidity other bank-specific factors considerably affect bank profitability. At the same time, they also found that concentration in the banking industry positively affect profitability of banks. Staikouras and Wood (2004) performed a research on European banks during the period of 1994 to 1998 by applying OLS technique and fixed effect model. They found that the interest rate is desirably correlated with profitability and GDP whereas growth rate had a significant negative effect on profitability as measured by ROA. Goddard et al. (2004) conducted a study by applying cross sectional regression analysis on 583 banks in Europe and found that GDP has a significant positive influence on profitability. Demirguc-Kunt and Detragiache (1998), accomplished a study on 45 to 65 countries considering both

developed and developing countries for a period of 1980 to 1994 by applying multivariate logitmodel. From their research outcome it is revealed that external factors are substantially responsible for the banking sector failure which in turn reduce profit earning capacity of banks. Naceur and Goaid (2008) established that bank with large volume of capital and overhead costs are positively related with net interest margin (NIM). But the size of the bank is negatively related with NIM. Zeitun (2012) considered ownership, bank-specific and macroeconomic variables to perform a research on some banks in Gulf Cooperation Council (GCC) during 2002 to 2009. He exhibited that bank equity and GDP affect positively on conventional bank profitability. However, cost to income ratio and inflation affect negatively on Islamic and conventional bank performances.

Ramadan et al. (2011) examined the correlation between profitability and bank-specific factors of Jordanian banks. They identified that well capitalized, low credit risk and efficient cost management tend to accelerate the profitability of banks but size of the bank is not a contributing factor to increase profitability. Waqas et al. (2014) performed a study in Pakistan and notified that there is an opposite relationship between bank profitability and inflation. They observed that increase in inflation enhances the cost of service and motivates its client to be unbanked. Kosmidou et al. (2005) conducted a research with 132 banks in United Kingdom (UK) for a period of 1998 to 2002 with an unbalanced panel data. They showed a strong positive influence of inflation, interest rate and GDP on banks' profitability. By performing a study in Kenya, Kiganda (2014) recommended that macroeconomic issues, like GDP, inflation and exchange rate do not significantly affect the profitability of banks. Scott and Arias (2011) carried out a study with the largest five banks in USA and found that GDP growth rate directly affects profitability of banks.

Even though extensive researches have been performed regarding the determinants of bank profitability in different nations, inclusive empirical evidence from developing countries is still vague or varied evidence (Almaqtari et al., 2019).

Even though extensive researches have been performed regarding the determinants of bank profitability in different nations, inclusive empirical evidence from developing countries is still vague or varied evidence (Almaqtari et al., 2019). Researchers tried to explore the impact of bank-specific issues and macroeconomic aspects on bank profitability which outcomes are not persistent with harmony.

2.3 Methodology of the study

This research work is predominantly based on secondary data set because of the nature of research. To investigate the impact of bank level characteristic variable, banking industry concentration and macroeconomic variables on bank profitability, a panel regression model was constructed. Intended to perform this analysis, we considered the bank level annual data of 57 commercial banks functioning in Bangladesh for a period of 2007 to 2017. In our study, profitability is proxied by Return on Equity (ROE), Return on Assets (ROA), and Net Interest Margin (NIM) as dependent variable accompanied by the set of bank-specific, industry-specific and macroeconomic factors as independent variables. For panel data analysis, Pooled Ordinary Least Square (POLS), Fixed Effect (FE) model and Random Effect (RE) model are generally used. To estimate the causal inference, Fixed-effect (FE) model was pointed out by Gangl (2010). We performed Hausman test to settle the best model for equation 1 to confirm the evidence in favor of a fixed effect modelling.¹

¹The relevant Hausman test chi-squared statistics is $\chi^2(13) = 131.00$ with p-value of 0.0000

2.3.1 Model specification

The econometric approach to estimate the model will be as in the following linear form:

$$\pi_{its} = \alpha + \sum_{j=1}^j \beta_j X^j_{it} + \sum_{l=1}^l \beta_l X^l_{it} + \sum_{m=1}^m \beta_m X^m_{it} + \varepsilon_{it} \dots \dots \dots \text{Equation -1}$$

$$\text{Where, } \varepsilon_{its} = v_i + \mu_{its}$$

Here, π_{its} is profitability of bank i at time t and measured at parameter s (Where $s = \text{ROA}_{it}, \text{ROE}_{it}$ and NIM_{it}) along with $i = 1, 2, 3, \dots, N$; $t = 1, 2, 3, \dots, T$. α is a constant term. The superscripts of j , l and m of X_{it} represent the descriptive variables (grouped into bank-specific, industry-specific and macroeconomic determinants respectively) and ε_{it} is the disturbance with v_i capturing the unnoticed bank-specific effect and μ_{it} the idiosyncratic error.

2.3.2 Profitability determinants of bank

We developed the above econometric model regarding the determinants of bank profitability using 3 types of proxy variables like i) bank-specific, ii) industry-specific and iii) macroeconomic variables (presented in Table 2.1)

2.3.2.1 The predicted variables

We used Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM) as the profitability indicators of banks in Bangladesh. ROA represents the extent of profitability of an organization to its assets depending on the effectual utilization of its asset to engender earnings. ROE embodies the measure of profitability of an organization in relation to its stockholders' equity. NIM measures the interest earning spread of an organization on its investing activities as a percentage of total interest earning assets. We tried to find out the significant impact

of bank-specific, industry-specific and macroeconomic variables on these three profitability indicators summarized in table 2.1.

Table 2.1: Elaboration of the variables of the study of bank profitability

Variables	Notation	Explanation	Expected Effect
Dependent variables to measure profitability			
Return on asset	ROA	Net profit to total assets ratio	
Return on equity	ROE	Net profit to shareholders equity ratio	
Net interest margin	NIM	Net interest income to interest earning assets ratio	
Independent variables			
<i>a) Bank-specific variables</i>			
i. Cost efficiency	TE/TR	Total expense to total revenue ratio	-
ii. Liquidity position	LA/TA	Liquid asset to total asset ratio	-
iii. Credit risk	TL/TA	Total loan to total asset ratio	-
iv. Capital adequacy ratio	TE/TA	Total equity to total asset ratio	+
v. Bank size	In TA	Natural logarithm of total asset of a bank	+/-
vi. Operating expense to total revenue ratio	OE/TR	Operating expense over total revenue (%)	-
vii. Non-performing loan to total loan ratio	NPL/TL	Non-performing loan over total loan (%)	-
viii. Overhead cost to total asset ratio	OH/TA	Overhead cost over total asset (%)	-
ix Total loan to total deposit ratio	TL/TD	Total loan over total deposit (%)	-
<i>b) Industry-specific variables</i>			
x. Concentration ratio	CR ₃	Sum of total asset of largest three banks over that of the industry	+/-
<i>c) Macroeconomic variables</i>			
xi. Economic growth rate	(% GDP)	Real GDP growth rate (%)	-
xii. Inflation rate	(% Inf)	Annual rate of inflation (%)	+
xiii. Bank spread	SR	Difference between average lending rate and deposit rate of banks	+

2.3.2.2 The predictor variables

a) Bank-specific predictor variables

i) Cost efficiency:

Total expense over total revenue ratio is a metric used to quantify the efficiency of banks' operating activities. It represents the efficient expense management for

doing banking operations which in turn enhance profit of the bank Edwards and Heggestad (1973). We assume significant negative relationship between cost efficiency and bank profitability.

ii) Liquidity position:

Liquid asset over total asset ratio represents the capacity of an organization to mitigate its service debt and short-term liabilities. Usually, higher liquidity ratio reduces liquidity risk but there is a tradeoff between liquidity and profitability. As loanable fund will be condensed by upholding higher liquidity, banks' earning potential will be reduced. Thus, we anticipate inverse relationship between liquidity and profitability.

iii) Credit risk:

Assessing borrower and the propensity to repay the loan amount by the borrower is considered to be the credit risk for a bank. As the underlying business of the bank is lending money, this risk affects the profitability of banks. Improper credit risk management enhances financial distress by reducing quality of assets and increasing loan losses which eventually reduces bank profitability. So, we assume negative association between credit risk and bank profitability.

iv) Capital adequacy ratio:

Capital adequacy governs the capital strength of an organization. It is measured by the proportion of equity (tire I and tire II) to total asset of the bank. In the study of Ebenezer et al. (2017) showed affirmative relationship between capital adequacy and the profitability of banks. Again, Swarnapali (2014) conducted a study among the commercial banks in Sri Lanka and observed a negative relationship between capital adequacy and banks' profitability. This ratio

ensures the financial stability by reducing the risk of insolvency. Bank with high capital adequacy ratio is treated as safe and be able to meet its financial obligations. Thus, we predict a positive relation between capital adequacy and profitability of banks.

v) **Bank size:**

We compute bank size by taking the natural logarithm of total asset. Due to economies of scale growing bank size is positively related with the profitability of banks but for administrative complication, large banks might be incompetent and become unprofitable. So, for working out the mixed impact of bank size we cannot predict its' influence on profitability of banks.

vi) **Operating expense to total revenue ratio:**

It shows the management competency to produce one unit of income by the one unit of expenses. Higher the quality of management, less amount of expense can generate more revenue. Accordingly, in our study, we assume negative relationship between operating expense with the banks' profitability.

vii) **Non-performing loan (NPL) to total loan ratio:**

In making lending decision, banks have to follow the regulatory guidelines directed by the controlling authority to keep the NPL at minimum level as well as to maintain quality of assets. Poor management and lower cost efficiency persuade high level of non-performing loan which eventually reduce bank profitability. Thus, we expect negative relationship between nonperforming loans to total loan ratio with the profitability of banks.

viii) Overhead cost to total asset ratio:

Overhead and administrative cost comprises operating expenses of an organization. We incorporated this variable in our study to perceive how it will affect profitability of a bank. Controlling this cost increase net earnings which ultimately enhances profitability of the organization. So, a positive relation of this ratio with the profitability has been expected.

ix) Total loan to total deposit ratio:

Asset-liability management of a bank is reflected with this ratio. Loan is considered as asset and deposit is considered as liability for the bank. Banks usually offer more loans to its customers, financed from deposits and other sources for increasing interest revenue. Even though there exists liquidity risk but higher of this ratio specifies that the bank is making use of its fund to generate profit. Again, lower the ratio means that the bank has excess liquidity and the performance of asset-liability management is not satisfactory. In this context bank will bear liquidity burden as well as cost of fund which will reduce profitability. considering the assumption of asset-liability mismanagement we expect negative influence of this ratio on bank profitability.

b) Industry-specific variables

x) Concentration ratio:

We use three bank concentration ratios in our study. It signifies the rate of top three banks' total assets to the total assets of all the banks within the industry. Usually, this ratio is used as a proxy to measure competition in the industry. While concentration is high competition is low and vice versa. Due to higher concentration, banks are able to take the advantage of economies of scale in

delivering banking services. At the same time encourages planning each other to earn more profit. Higher the market concentration, the higher is their profit as a result of their collusive behavior (Genchev, 2012). According to the structure-conduct-performance (SCP) hypothesis, banks can earn monopoly profit when acting in a highly concentrated market as they are tending to collude (Gilbert, 1984). Also, there is a risk of 'too big to fail' by anticipating the reluctant attitude of the regulatory body to let the bank fail due to insolvency. Again, excessive competition creates unstable banking environment while insufficient competition tempted inefficiencies and provide lower quality services. Such diverse influence was observed with this ratio on bank profitability from the study of different literatures. So, its impact on profitability cannot be projected and to be answered from our empirical analysis.

c) Macroeconomic variables

xi) Economic growth rate:

We measure economic growth rate through Gross domestic product (GDP) growth rate. It is the economic snapshot of a country which indicates how fast an economy is growing. Sound GDP growth indicates that the economy is stable and people are reluctant to take loan from the bank. As a result, bank reduces its' business risk as well as profitability will be reduced. For this risk-return tradeoff we expect inverse relationship between economic growth and bank profitability.

xii) Inflation rate:

Inflation reduces purchasing power of the money which persuades demand for money. As a result, banks can increase their interest margin by adjusting their interest rate to recompense for the inflation premium. In a study of 80 countries

Kunt and Huizinga (1999) observed a positive relationship between inflation and NIM. So, our hypothesis is, banks' profit is positively related with the inflation rate.

xiii) Bank spread:

The positive difference between interest charged against deposits and interest earned on its lending activities termed as interest rate spread which regulates banks' earning. Increased demand and providing better service for the accomplishment of loan triggered up interest rate for lending that ultimately increase bank spread. Therefore, we expect positive correlation between bank spread and profitability.

2.4 Data sources and variable description

Bank level data have been obtained from the annual reports of different banks in Bangladesh. The data of macroeconomic variables i.e. real GDP growth rate, the rate of inflation and the term spread of interest rate have been obtained from Bangladesh Bank and Bangladesh Bureau of Statistics. We have evaluated the model using the STATA statistical software. Table 2.2 embodies the summary statistics of the predictor variables employed in our study.

Table 2.2: Summary statistics of the predicted and predictor variables in the study of bank profitability

Variables	No. of Observation	Mean	Std. Dev	Min	Max
Dependent variable					
Return on asset (ROA)	531	0.0091	0.0200	-0.1400	0.1260
Return on equity (ROE)	534	0.2870	1.1200	-18.3000	7.5850
Net interest margin (NIM)	519	0.0711	0.4830	-0.0616	9.1980
Independent variables					
<i>Bank-specific variables</i>					
Cost efficiency (TE/TR)	524	0.8430	0.5440	0.0835	12.1900
Liquidity position (LA/TA)	519	0.1720	0.1900	0.0013	3.0670
Credit risk (TL/TA)	517	0.6290	0.3380	0.0000	7.1790
Capital adequacy ratio (TE/TA)	483	0.1560	0.4250	0.0018	6.2670
Bank size (In TA)	533	25.1700	1.1480	20.9300	27.8500
Operating expense to total revenue ratio (OE/TR)	522	0.2920	0.5110	0.0398	11.4800
Non-performing loan to total loan ratio (NPL/TL)	487	0.1060	0.1910	0.0000	1.2130
Overhead cost to total asset ratio (OH/TA)	519	0.0130	0.0452	-0.0072	1.0210
Total loan to total deposit ratio (TL/TD)	516	0.9860	2.1030	0.0207	43.5000
<i>Industry- specific variables</i>					
Concentration ratio (CR ₃)	627	0.2640	0.0304	0.2340	0.3330
<i>Macroeconomic variables</i>					
Economic growth rate (real GDP %)	627	6.2890	0.5990	5.1000	7.2840
Inflation rate (% Inf)	627	7.5280	1.5160	5.8300	10.6200
Bank spread (SR)	513	5.0660	0.3210	4.4400	5.5100

From table 2.2, we see that in Bangladesh the banks incurred average ROA of 0.91%, ROE of 28.7% and NIM of 7.1% from 2007 to 2017. The standard deviations for ROA, ROE and NIM are 0.0200, 1.120 and 0.483 respectively, which shows sensible deviations in the profitability of Bangladeshi banks. It is apparent that greater sample size reduces the standard deviation because of the averaging out of deviations. This might be the cause of notable deviation in our study. Bank-specific factors have average values of 15.6%, 29.2%, 10.6%, 1.30% and 98.6% for the ratio of TE/TA,

OE/TR, NPL/TL, OH/TA and TL/TD with standard deviation of 42.5%, 51.1%, 19.1%, 4.52% and 210.3% respectively.

In supply side macroeconomic framework, economic growth rate measured by real GDP growth rate varies between 5.10 and 7.28 with an average value of 6.29. Likewise, the minimum value of inflation and bank spread are 5.83 and 4.44 where the maximum values are 10.62 and 5.51 respectively with a mean of 7.53 and 5.07 respectively. Regarding industry-specific variables, CR₃ has an average value of 26.4% with a standard deviation of 3.04% (Min. = 23.4%, Max. = 33.3%) which indicate moderately competitive banking industry in Bangladesh. Table 2.3 depicts the Average value of ROE, ROA and NIM which are to be considered as profitability variables in our study.

Table 2.3: Year on year average ROE, ROA and NIM of banks in Bangladesh from 2007-2017

Year	Mean Return On Equity (ROE)	Mean Return On Asset (ROA)	Mean Net Interest Margin (NIM)
2007	-0.0665	0.0079	0.0422
2008	0.4416	0.0111	0.0362
2009	0.6181	0.0114	0.1832
2010	0.5259	0.0166	0.2605
2011	0.3766	0.0114	0.0638
2012	0.1687	0.0052	0.0369
2013	0.1759	0.0047	0.0764
2014	0.2059	0.0074	0.0231
2015	0.3287	0.0101	0.0234
2016	0.1807	0.0074	0.0402
2017	0.2622	0.0082	0.0284

From figure 2.1, we observe that within the study period (2007-2017), ROE was highly deviated from the mean in 2007 and 2009, ROA was steadily deviated from the mean throughout the period, and significant deviation of NIM was found in 2010.

The three profitability indicators give different degree of extent from the mean during the time span of the study.

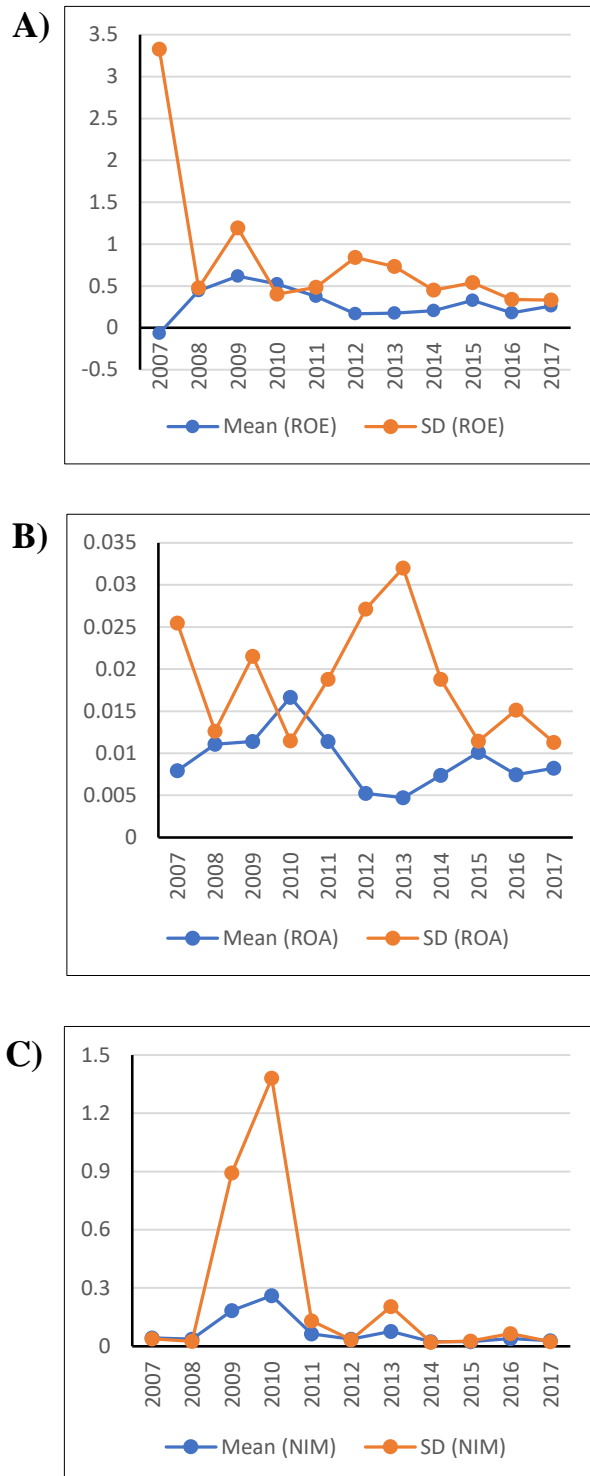


Figure 2.1: Trend of average and standard deviation of A) ROE, B) ROA and C) NIM of commercial banks in Bangladesh from 2007 to 2017 (Source: Annual reports of different commercial banks in Bangladesh)

2.5. Diagnostic test

In table 2.4, variance inflation factor (VIF) test has been furnished to determine multicollinearity problem among explanatory variables of our study. The outcome of test shows that VIF for every independent variable is less than 10 (cut off value of VIF) and the average is less than 2. Acceptable value of each variable is less than 10. Thus, the model of the study is away from the multicollinearity problem.

Table 2.4: Test of multicollinearity

Variables	VIF	1/VIF
i. Cost efficiency (TE/TR)	1.93	0.5174
ii. Liquidity position (LA/TA)	1.27	0.7898
iii. Credit risk (TL/TA)	1.15	0.8680
iv. Capital adequacy ratio (TE/TA)	2.51	0.3980
v. Bank size (In TA)	2.73	0.3658
vi. Operating expense to total revenue ratio (OE/TR)	2.46	0.4058
vii. Non-performing loan to total loan ratio (NPL/TL)	1.28	0.7807
viii. Overhead cost to total asset ratio (OH/TA)	1.57	0.6376
ix. Total loan to total deposit ratio (TL/TD)	1.18	0.8488
Mean VIF		1.79

2.6. Empirical result

Hausman test confirms the justification of using fixed effect estimator. In this model we use Driscoll and Kraay (1998) standard error which suggested a non-parametric covariance matrix estimator that constructs heteroskedasticity and autocorrelation consistent standard error (Driscoll and Kraay standard errors) that are strong to general forms of spatial and temporal dependence. Specially Driscoll-Kraay standard errors are well adjusted when the regression residuals are cross-sectionally dependent. Table 2.5 presents the regression output of the empirical model of our study in equation-1 consistent with the fixed effect model estimator of the profitability determinants of ROA, ROE and NIM of the commercial banks in Bangladesh.

Table 2.5: Result outcome of the fixed-effect model for the determinants of bank profitability in Bangladesh from 2007 to 2017

Dependent variables	ROA	ROE	NIM
Constant	0.4030 ^{***} (0.0636)	2.7450 (3.4050)	0.728 [*] (0.356)
Independent variables			
Bank-specific variables			
Cost efficiency (TE/TR)	-0.0258 ^{***} (0.0056)	0.4720 (0.3620)	-0.0635 ^{***} (0.0070)
Liquidity position (LA/TA)	-0.0109 ^{***} (0.0018)	-0.1780 (0.1410)	0.0195 (0.0227)
Credit risk (TL/TA)	0.0001 (0.0004)	0.0736 ^{***} (0.0142)	0.0055 (0.0044)
Capital adequacy ratio (TE/TA)	-0.0006 (0.0006)	-0.1840 [*] (0.0990)	0.0017 (0.0047)
Bank size (In TA)	-0.0146 ^{***} (0.0011)	-0.1360 [*] (0.0701)	-0.0358 ^{***} (0.0092)
Operating expense to total revenue ratio (OE/TR)	0.0340 ^{**} (0.0114)	-0.6350 (0.6580)	-0.0083 (0.0975)
Non-performing loan to total loan ratio (NPL/TL)	-0.0025 (0.0037)	0.0755 ^{**} (0.0264)	0.0066 [*] (0.0035)
Overhead cost to total asset ratio (OH/TA)	0.0353 (0.1850)	-11.1000 (9.8020)	-0.1090 (1.1140)
Total loan to total deposit ratio (TL/TD)	0.0004 ^{***} (0.0001)	-0.0067 [*] (0.0032)	-0.0013 [*] (0.0008)
Industry-specific variables			
Concentration ratio	-0.1870 [*] (0.0775)	14.0600 [*] (5.476)	0.0551 (0.3590)
Macroeconomic variables			
Economic growth rate (% GDP)	0.0017 (0.0028)	-0.0223 (0.0923)	0.0241 ^{**} (0.0078)
Inflation rate (% Inf)	-0.0023 [*] (0.0013)	0.0570 ^{***} (0.0129)	-0.0073 [*] (0.0030)
Bank spread (SR)	0.0086 (0.0078)	-0.5650 ^{***} (0.0718)	0.0301 ^{**} (0.0094)
No. of observations	383	383	383
Within R- Square	0.2452	0.1166	0.1843
F- Statistics	(0.0000)	(0.0000)	(0.0000)

Note: The above table reveals the regression output from the fixed effect evaluation of the determinants of ROA, ROE and NIM coefficients which are considerably different from zero at the 1%, 5% and 10% level are marked with ***, **, * respectively and Drisc/Kraay standard errors in the parentheses.

Among bank-specific variables, cost-efficiency is highly significant and negatively correlated with profitability at the 1% significant level while profitability is measured by ROA, and NIM which is supported with the findings of the study of UK banks by Kosmidou et al. (2005). This negative correlation suggested that a rise in total expense in relation to total revenue would decrease bank profitability. This finding is also similar to the determinants of bank profitability and the consequence of expense preference behavior theories of Edwards (1977). In a study, Edwards and Heggstad (1973) showed that efficient expense management to be the most influential determinant of bank profitability. Competent management of expenses will enhance profitability of the banks.

Liquidity position of the bank, measured with the ratio of liquid asset to total asset has a strong significant negative impact on profitability while measured in terms of ROA. This finding is confirmed our prediction and in line with the tradeoff theory of profitability and liquidity. If the bank does not maintain adequate amount of liquidity, it becomes illiquid for which the bank may lost its goodwill and lucrative investment opportunity which eventually turn into a risky position. Again, huge amount of investment in current asset will reduce profitability as idle money will not generate anything. This finding is similar to the study with Molyneux and Thorton (1992).

Credit risk has significant positive associated with ROE and also positive with ROA and NIM which is similar with the study of Boahene et al. (2012) and Saeed and Zahid (2016). It indicates that, banks can charge more interest to make up the risk of default which intern induce more profit. By giving loan banks can increase its earning through charging fees, commission etc. Again, we also experienced, core banking operation is profitable for banks putting the NPL in one side. This outcome is similar with Dietrich and Wanzenried (2011).

Capital adequacy is negatively correlated with ROA and ROE which means that the higher the capital the lower is the profit of the banks. This result outcome is alike with the study of Goddard et al. (2004a) and Angbazo (1997). They argued that the relationship between capital adequacy and bank profitability should be negative as overcapitalization of a bank indicates unused investment opportunity. In a study of the impact of capital on the performance of commercial bank, Berger (1995b) observed similar result and argued that reduction of external borrowing increases bank performance. He also stated that in the conventional risk return hypothesis, risky position with lower capital can generate sophisticated profits. As a safety measurement, banks may set aside a portion of its earning as buffer which may affect profitability. Despite of taking various efforts by the regulators in time to time, the capital base is not supported to achieve the objective of accelerating profitability. Rather protecting depositors maintain stability and emphasize on increasing confidence in banking industry Barnor and Odonkor (2013) and Blum (1999). We also observed that capital adequacy is positively correlated with NIM but not statistically significant. It means that bank with adequate level of capital can cope up any potential shocks and develop financial strength.

Bank size has a strong significant negative correlation with all the determinant of bank profitability. It suggests the absence of economies of scale in the Bangladeshi banking sector and hold the proposition of “too big to fail”. Increase in size also require some overhead and administrative costs which will reduce bank profitability.

Operating expense to total revenue has a statistically significant positive relationship with ROA. It implies that bank will enhance its' profitability through attracting its customers by rendering better services and using improved technologies. At the same

time a rise in operating expenses leads to increase lending rate which will negatively affects NIM and ROE.

In our study non-performing loan ratio has positive significant relationship with ROE and NIM in line with the study of Jimenez and Saurina (2006) and Sufian and Noor (2012). During economic uptrend, risky borrowers take more loan and increase interest income. High level of NPL can be leveled for high interest spread which we have experienced in our study as we found the significant relationship of bank spread with ROE and corroborate with the study of Were and Wambua (2014). In a booming economy customers are able to generate more earning through investment by borrowing. This will support the investor to honor debt and hence lowering NPL.

Total loan to total deposit ratio significantly and positively affects the profitability of banks while measured by ROA and negative with ROE and NIM in Bangladesh. It shows the capability of the bank to cover loan losses and withdrawals of its customers. Bank profit is mainly generated from stimulating interest against deposits which means profit is equipped with the positive difference between interest of loans and interest on deposits. Banks mobilize its fund from the deposits and offer various kinds of deposit schemes to its clients and financial institutions which have a link with the profitability of the banks (Rasiah and Tan, 2010). Based on our study it is recommended that banks should offer more loan with proper investigation to generate revenue and accumulate more profit.

Concentration in the banking sector in Bangladesh has significant impact on profitability. It affects positively on ROE and NIM but negatively on ROA, indicating the structure-conduct-performance hypothesis which states that market structure influences the competitive behavior which further affects bank profitability. Banks in highly concentrated markets act less competitively and capture more profit

(1951). The negative relationship with ROA indicates, due to monopolistic position high concentrated banks contribute lower profitability. Thus, Bangladeshi bank can exercise their authoritative power to charge higher interest rates on credits and pay lower interest rates on deposits. The similar result is achieved in Athanasoglou et al. (2006).

Among the macro-economic variables, we observed significantly positive correlation of GDP growth rate with ROA and NIM. It is similar with the results of Bourke (1989), Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999), and Athanasoglou et al. (2006) where they detected a positive association between GDP growth with bank profitability. Due to favorable economic condition, economic activities are growing, household savings are increasing and demand for enterprise financing leads to increase the growth rate of GDP. Therefore, the progress of economic activities upsurges the demand for banking services which intensify bank profitability. But we obtained an insignificantly negative relation with ROE. We observed positive coefficient of bank spread with ROA and NIM. The explanation is that confidence in economy may grow which might encourage businesses to raise their bank borrowings. As a result, banks may have the opportunity to gain more from its lending activities (Kosmidou et al., 2005). But this variable has significant negative impact on ROE which means that asset sensitive banks are negatively influenced by the increase in spread and vice versa. This impact is in line with the impact of non-performing loan which will grasp the benefit of interest rate spread. This entails bankers to put emphasis on their asset and liability management to defend themselves from the adverse deviations in interest rates. Inflation is negatively related to ROA and NIM but positive significant relation with ROE. This advocates that commercial banks in Bangladesh are not able to adjust the lending rates to reflect the

rise in overall price level quickly and appropriately. Consequently, they endure part of the cost of inflation on their profits. Again, significant positive impact of GDP and bank spread and negative impact of inflation on NIM indicate the pro-cyclicality of bank profitability in Bangladesh.

2.7 Conclusion and consequences

This research study provides comprehensive new insights of different managerial issues that are accountable to enhance profitability of banks in Bangladesh. Regarding the significance of the explanatory variables and the directional relationship with response variable harmonize with the other studies with a little exception. We observed that the effect of the variables is diverse with the different proxies of profitability. Research outcome established that all the factors of our study are relevant. This study inferred that some of the bank-specific factors possess some substantial effects on bank profitability in Bangladesh. Our empirical result shows that cost efficiency has highly significant impact on the measures of profitability. Cost efficiency can be improved by dropping undesirable working expenses. Overhead cost negatively influences ROE and NIM, but the impact is insignificant. Equity holders of the banks should have considerable attention in this regard for maximizing its wealth. Furthermore, while total loan to deposit ratio is positively and significantly associated with profitability, overhead expenses have also the same, suggesting that efficient fund management including investment and assessed expenditure should be given a specific care by the bank. Furthermore, we observed an evidence of negative significant correlation between liquidity and profitability while measured in terms of ROA but not significant with ROE and positive with NIM. Bank size has negative and significant effect on all the profitability indicators, indicating that growth in bank size is meaningless regarding profitability rather efficient cost management, maintaining

adequate liquidity and providing more loans can significantly enhance profitability of banks in Bangladesh.

Among the three macroeconomic variables, inflation perceived negative effect but economic growth rate has significant positive influence and bank spread has significant positive relationship with the profitability of core banking operations measured by NIM. Again, inflation is significantly positively and bank spread is significantly negatively related with ROE of banks in Bangladesh.

The future researchers may perform comparative study in different dimensions likely, comparison between private banks and state-owned banks, comparison between traditional banks and Islamic banks etc. Further research can be carried out including other explanatory variables such as, corporate governance, corporate social responsibility (CSR), corporate tax rate, and deposit insurance to accelerate the model. Structural equation modeling, mediation effect modeling can be used to construct econometric model. Extended time adjustment analysis is desirable in the variables to magnify the profitability of banks in Bangladesh. Finally, the outcomes of the study are very much policy relevant and an important contribution to the existing literature.

Appendix 1

In table 2.6 the correlation matrix exhibits the degree of correlation among the response variable and the predictor variables considered in the regression analysis. The matrix represents a weak correlation among the independent variables.

Table 2.6: Pair wise correlation matrix of the variables used in the study of bank profitability¹

Variables ²	(ROA)	(ROE)	(NIM)	TE/TR	LA/TA	TL/TA	TE/TA	In (TA)	OE/TR	NPL/TL	OH/TA	TL/TD	(CR3)	(% GDP)	(% Inf)	SR
ROA	1.000															
ROE	0.094**	1.000														
NIM	0.012	-0.008	1.000													
TE/TR	-0.166***	0.479***	-0.046	1.000												
LA/TA	0.005	0.072*	0.532***	-0.075*	1.000											
TL/TA	0.069	-0.032	-0.039	0.005	-0.152***	1.000										
TE/TA	-0.054	-0.091**	0.060	-0.067	0.527***	-0.106**	1.000									
In (TA)	0.055	-0.011	-0.049	-0.054	0.467***	-0.047	0.696***	1.000								
OE/TR	-0.036	0.517***	0.014	0.939***	0.018	-0.024	0.041	0.032	1.000							
NPL/TL	-0.458***	-0.074*	-0.044	0.095**	-0.060	-0.083*	0.238***	0.061	0.056	1.000						
OH/TA	0.058	0.533***	0.012	0.915***	-0.013	0.010	-0.012	0.028	0.972***	-0.027	1.000					
TL/TD	0.232***	-0.006	-0.003	-0.063	-0.068	0.210***	0.049	0.154***	-0.027	-0.036	-0.013	1.000				
(CR3)	0.062	0.105**	0.040	0.039	-0.063	0.125***	-0.102**	0.251***	0.047	-0.066	0.079*	0.005	1.000			
(% GDP)	-0.074*	-0.087**	-0.103**	-0.016	-0.004	-0.080*	-0.020	-0.193***	-0.002	0.034	-0.025	-0.043	-0.424***	1.000		
(% Inf)	0.004	0.073*	-0.012	0.054	0.007	0.028	-0.005	0.103**	0.036	-0.021	0.084*	-0.015	0.283***	-0.173***	1.000	
SR	0.037	0.071	0.051	-0.012	0.019	0.065	0.057	0.158***	-0.139***	-0.020	0.049	0.016	0.521***	-0.623***	0.818***	1.000

*** p<0.01, ** p<0.05, * p<0.1

¹Stata output

² Refer to the table 2.1 of the summary statistics for details of the variables name

Chapter Three

Impact Assessment of Market Structure on Bank Profitability: Dynamic Panel Evidence from Commercial Banks in Bangladesh

3.1 Introduction

Banks are the potential scope for mobilizing financial resources to promote economic growth. These are profit oriented service industry. A sound banking sector provides a base for stabilizing financial system to accomplish earnings for developing economy. Some commercial banks are renowned for their profitability but some other banks weakened, this induce questions about some factors which will be dominated by the bank management to determine their profitability. It is the capability of a business to get profit which is the main objective of all commercial ventures. In bank business, determining present and earlier profitability and predicting upcoming profitability are imperative.

It is important to examine bank characteristics, industry structure and macroeconomic variables in explaining the profitability of a bank. To maintain financial stability and to defend any negative shocks, it is badly needed to identify the significant determinants which have mostly influence on bank profitability. In 1971, only four domestic national banks: Sonali Bank, Agrani Bank, Rupali Bank, and Janata Bank were there in Bangladesh. Only three foreign banks and no private banks were there at that time (Alam and Riyadh, 2003). Liberalization policy was initiated in 1980 and first private commercial bank was started in 1982, named Arab Bangladesh Bank Ltd. At the end of 2017 there were six (6) state owned, thirty nine (39) private commercial

banks, three (3) specialized banks, nine (9) foreign banks and five (5) non-schedule banks in our country (Annual Report of Bangladesh Bank, 2017-18). Bangladesh Bank is the supervisory authority to oversee the activities of scheduled banks and financial institutions in Bangladesh. According to Mujeri and Younus (2009) 96% of total assets of the monetary sector are accounted in the banking area in Bangladesh.

Empirical literatures provide two constructing hypotheses relating to market structure & efficiency to determine profitability of the banks which is directly related with structure conduct performance (SCP) hypothesis and efficient structure hypothesis (ESH). In traditional SCP supposition, market structure influences the competitive behavior which further affects the bank profitability. Banks in highly concentrated markets behave less competitively and capture more profit (Bain, 1951). On the other hand, ESH advocates that bank profitability is derived from the degree of efficiency rather than concentration (Demsetz, 1973). So, it is required to investigate market concentration and competitiveness along with efficiency which persists in commercial banks and its consequence on profitability of banks in Bangladesh. Figure 3.1 shows the development of bank business in Bangladesh from 1980 to 2018.

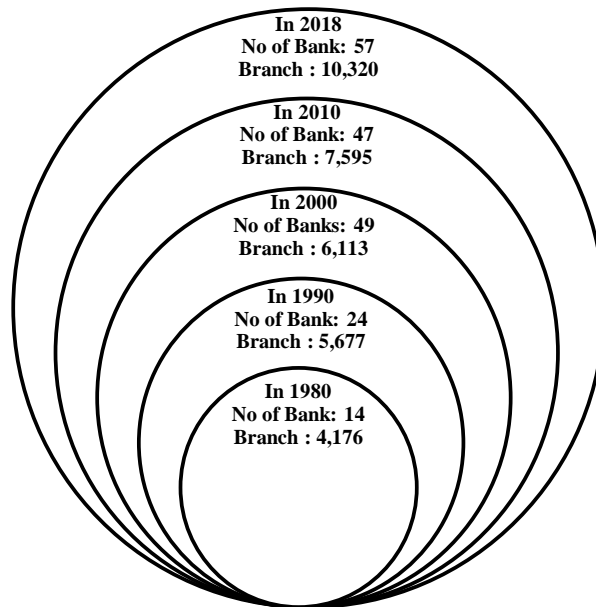


Figure 3.1: Gradual progress of bank business in Bangladesh from 1980-2018 (Source: Bangladesh Bank)

The present study is a modest attempt to explore the effect of market structure on the profitability of 57 commercial banks after governing the influences of some bank-specific and macro-economic issues. The specific objective of the study is (i) to explore the status of competition and concentration in the banking arena in Bangladesh and (ii) to access the influence of competition and concentration on commercial bank's profitability. Along with this, the study also perceives the impact of economic development on bank profitability.

3.2 Theoretical background of the influence of market structure on profitability

Aligning with the objective of the study, some existing literatures have been reviewed related to the study variables, the consequence of market concentration and efficiency on the profitability of the commercial banks.

In a free economy, market structure outlines the patterns of market organization. Some types of market structures are monopolistic competition, oligopoly, monopoly and perfect competition (Smith, 1776). In monopolistic competition, many producers sell products or services that are not perfectly substitutes. In oligopoly, an insignificant number of companies together regulate the mainstream of market segment. In monopoly, only one service provider exists and in perfect rivalry, identical products are traded among limitless number of manufacturers and customers and demand curve is elastic. In relation to this, relative market power (RMP) hypothesis states that companies which have huge market shares control the price of their products and attain competitive earnings (Berger, 1995). 'Market concentration' is used when top companies comprise huge fraction of the entire market. The value of top companies or top 'n' companies may be three or maximum five. If the top companies retain on attaining more market share, the industry is said to be highly concentrated and if the concentration is low the industry is said to be highly competitive. High concentration indicates uncompetitive and hence inefficient market. In case of potential consent, high concentration affects both 'behavior' and 'profitability' of a bank.

Pawłowska (2016) measures competition amongst banks based on structural and non-structural method. Structural approach comprises of SCP model developed by Bain (1951) and ESH developed by Demsetz (1973). ESH in the banking literature reveals that higher efficiency enhances higher profitability. According to this theory more competent banks have lower costs and gather larger market share (Demsetz, 1973; Pelzman, 1977). Bank efficiency is governed by various bank specific elements like capitalization, profitability, GDP growth, inflation, real interest rate and ownership structure (private or government). Among these factors' capitalization is an internal

determinant which affects directly on bank efficiency as low capitalization leads to depict credit risk and high capitalization may upshot in higher cost and reduce profitability. Being consistent with this issue, Pancurova and Lyocsa (2013), Casu and Molyneux (2003), Mirzaei and Moore (2014) and Barry et al. (2010) established that a positive relationship persists between capitalization and efficiency whereas Mohanty et al. (2013) and Ab-Rahim et al. (2012) exposed that capitalization influences effectiveness negatively.

The non- structural approach comprised of either total industry data or discrete firm data do not consider the level of concentration. It can be assumed here that the competition depends on other market features like hindrances to entry and exit. In SCP model, when market is more concentrated, there exists less competition which leads to higher profitability. In ESH, highly effective firms (banks) are operated in concentrated markets which are the determining factor of market structure. Hicks (1935) established a concept which contradicts to the ESH, and termed as Quiet Life (QL) theory. In this theory, greater market strength banks get privileged position and undergo lower cost efficiency because of quiet life of their managers. Bikker and Leuvensteijn (2014) states that in QL hypothesis, efficiency can be attained through monopolistic pressure. Smirlock (1985) opposed to the relationship between concentration and profitability, and experienced RMP hypothesis which established a relation between bank market segment and profitability. Mirzaei et al. (2013) also supported this relationship. Hahn (2008) tested the hypothesis of SCP, RMP and ESH in Austrian banks and found supporting evidences on SCP hypothesis and recommends that extra profits are negligible. Yu and Neus (2005) studied on German banking sector which supports both the ESH and SCP hypotheses.

From the analysis of the research article of Molyneux and Thornton (1992) and Cetorelli (2004), it is found that the ownership structure of banks had no influence on their profitability. In this sense, Demirguc-Kunt and Huizinga (1999), Goddard et al. (2001) confirmed an optimistic association between concentration and profitability and emphasized on traditional SCP hypothesis. Claessens and Laeven (2004) stressed that concentration boost up competition. By analyzing the concentration ratio, the market participants get an idea about competition. In a progressive economy, concentrated banking system enhanced competitive operation.

In case of emerging economy, the ownership structure of the bank is an important determinant of competition. Foreign ownership supports competition at the earlier stage, while government ownership is a hindering factor against competition later. Typically, competition exists in developed economy but dubiously progress at the similar rate in flimsy economy as examined by Delis (2012) using the Boone indicator for 84 banking systems in the globe.

The introducer of Boone indicator, Boone (2008) measured the effect of performance efficacy in terms of profits or market-share. The basic notion of this indicator is that efficient banks could improve their performance through competition and the opposite scenario is experienced for inefficient banks. According to this theory, banks can attain higher profit when they can reduce their marginal cost. If this consequence is robust, the level of competition will be enhanced in a specific market Leuvensteijn et al. (2011) used the Boone indicator for the first time to determine bank efficiency in the Euro area. This approach is nearly related with the efficacy theory (Goldberg and Rai, 1996; Smirlock, 1985), which also describes that banks' performances depend on alterations in efficacy.

After studying a sample of 23 industrialized countries Bikker and Haaf (2002) showed the existence of negative relationship among the grade of concentration and the degree of competition. In this study the researchers used H-statistic to analyze the variety of concentration indices. Conflicting with these outcomes, Angelini and Cetorelli (2003), revealed a favorable relationship by means of the Lerner index and the Herfindahl–Hirschman index (HHI) in the analysis of Italian banking sector.

SCP hypothesis developed by Bain (1951) expound competitive performance in the banking industry due to market structure (Bikker, 2004) through concentration ratios measured by HHI. Research on most of the US and European banking found some relationship between concentration and profitability as analyzed by Goddard et al. (2001). During the period of 1992-2004, restructuring and consolidation among Korean commercial banks decreased competition and increased concentration but for the growing concern improved concentration did not lessened competition (Park, 2009).

To accept or reject between SCP and RMP hypothesis, Molyneux and Forbes (1995) examined a set of European countries and found insignificant values of concentration index for RMP, thus, rejecting the RMP and accepting the SCP theory. Maudos (1998) examined the relationship among SCP, RMP and ESH models in Spain and found support for the RMP models and efficiency.

Berger and Hannan (1989) analyzed the association among concentration and price in lieu of a direct measure of profitability in US deposit market and revealed that extremely concentrated markets have charge higher overhead expenditure, greater rates on loans and lesser rates on deposits compare to less concentrated markets. However as stated by Berger et al. (1998), best accomplished banks are situated in vastly concentrated markets. Again, Peterson and Rajan (1995) found that in more

concentrated banking markets, firms can sanction their credit without much difficulty. A brief study on the Indian banking arena throughout the period of 2000-2008 concluded that liquidity and operating expenses have significant impact on bank profitability (Sufian and Noor, 2012).

The term 'competition in the market' originated in the book of 'wealth of Nation' (Smith, 1776) in which competition is not defined as the state or condition but the contest among the competitors to achieve the market share. However, this conception is confronted by the Australian School as an ongoing active competitive process (Leon, 2014), continuously generating and adopting new products and procedures to deal with competition. Stigler (1957) defines as 'a competition among individuals (or group or states)', and it arises when two or more parties attempt for something that all cannot get. This rival condition occurs by providing benefits to customers through lowering prices, increasing quality and accelerating innovation for which firm level of efficiency will be improved.

The traditional SCP theory advises that market structure influences the competitive conduct of banks which further affects the bank profitability. This is because highly concentrated banking structure encourages banks to plan with each other to make more profit. A study of 69 countries was conducted by Beck et al. (2006) focusing that cross –country analysis indicated an optimistic association between competition and constancy in the banking system which will enhance profitability in the long run. Opposing to this view, greater bank competition results in financial instability by decreasing market power, which consequently reduces profits and assets value, supporting the competition fragility (Marcus, 1984; Keely, 1990; Carletti and Hartmaan, 2002). Staikouras and Koutsomanoli-Fillipaki (2006) exhibited that an efficient bank can maximizing profit in two ways: either by maintaining present prices

and company size or by dropping charges and increasing the extent of the company. If the bank selects the second option, it will gain market share without reducing the competitiveness.

In economics, market concentration is measured by considering the number of companies and their particular shares of the total production or total reserves in a market. It is the grade to which production in an industry – or in the economy as a whole is dominated by a few big companies. Banking concentration can be in terms of geography, size (asset-liability), products, sector and other dimensions. Banks, functioning in a concentrated market have some market control and might be more cautious in risk-taking which may enhance profits, either by higher interest rate or less loan loss provision (Boyed et al., 2004). Concentration- fragility opinion specifies that banks operate in a concentrated environment using monopoly power in the loan market, which in response generate ethical hazard and make it tougher for the customer to refund the loan (Berger et al., 2009).

In Bangladesh, a study has been done by Uddin and Gupta (2012) and it found that market was highly concentrated in 1997. After that there has been a substantial reduction in concentration and market is highly competitive till 2010. Another study was performed by Ahamed (2012) for the period of 1999-2011 by means of random effects (RE) estimator. They used both the theory of SCP and ESH to examine the association between concentration and competition in the banking area. This study supported SCP hypothesis and found that profitability in the banking area in Bangladesh is measured by concentration not by the market share of banks. It shows that concentration drops the cost of collusion between banks and generates greater profit for all market participants.

3.3 Empirical method of the study of impact of market structure on profitability

This study is mainly based on secondary data set due to the nature of the research. It uses a panel regression model to comprehend the relationship among competition and profitability of the commercial banks in Bangladesh for the period of 2007- 2017. For panel data analysis, pooled ordinary least square (POLS), the fixed effect model, or the random effect model is usually used. In the context of causal implication fixed effect (FE) regression method is used (Gangl, 2010). With this vision in mind, we studied whether the individual effects are fixed or random. The relevant Hausman test has been performed for equation 1 to confirm the evidence supporting the fixed effect modeling²

3.3.1. Empirical design: An analytical framework

The study constructs an unbalanced data set using the bank level annual data from 57 commercial banks operating in Bangladesh from the time span of 2007 to 2017. In this study, a panel regression is estimated having measure of profitability by ROA and exercise its competitive power or the degree of concentration, if any. Thus, ROA has been considered as dependent variable along with the set of bank specific variables, industry specific variables and macroeconomic indicators as independent variables.

² The relevant Hausman test chi-squared statistics is $\chi^2(11) = 51.77$ with p-value of 0.0000

3.3.2. Model specification

The econometric approach to estimate the model will be as in the following linear form:

$$ROA_{it} = \alpha_0 + \sum_{j=0}^j \beta_j X^j_{it} + \sum_{l=0}^l \beta_l X^l_{it} + \sum_{m=0}^m \beta_m X^m_{it} + v_{it} + \mu_{it} \quad \dots$$

Equation-1

Where ROA is the return on asset of bank i at time t ; where $i = 1, 2, 3, \dots, N$; $t = 1, 2, 3, \dots, T$. α is a constant term. The superscripts j , l and m of X_{it} represent bank specific, industry specific and macroeconomic determinants respectively. v_{it} and μ_{it} are the unnoticed bank specific effect and the idiosyncratic error.

3.3.3 Description of the bank profitability determinants

We established the above econometric model to assess the impact of market competition and concentration on the profitability of banks by using 3 types of proxy variables like i) bank- specific, ii) industry- specific and iii) macroeconomic variables (presented in table 3.1)

3.3.3.1 Dependent variable

We used Return on asset (ROA) as the profitability indicator of banks in Bangladesh. ROA represents the extent of profitability of a company to its assets depending on the efficient utilization of its asset to stimulate earnings. We try to find out the significant impact of bank-specific, industry-specific and macroeconomic variables on this profitability indicator.

3.3.3.2 The explanatory variables

a) Firm specific variables

i) Expense management:

Operating expenses over total cost represent the expense management of an organization. Usually, operating expenses are characterized by overhead, administrative and maintenance costs. Proper management of these costs upholds efficacy of the bank and increase competitiveness. We use this ratio in our model to perceive how this variable affects profitability of banks in Bangladesh. Predominantly, for one unit rise in operating expense will be compensated by perusing additional earnings on regular profit margin. Thus, a positive sign has been predicted.

Table 3.1: Explanation of the variables considered in the study of market structure impact on bank profitability

Variables	Description	Expected Effect
Dependent variable		
Return on asset (ROA)	Net profit to total assets ratio	
Independent variables		
<i>Bank-specific variables</i>		
i) Expense management	Operating expenses to total assets ratio	+
ii) Equity position	Total equity to total assets ratio	+
iii) Total loan to total deposit	Total loan to total deposit	+
iv) Required reserve ratio	Required reserve to total assets ratio	+
v) Employee productivity	Net profit to no. of employees	+
vi) Liquidity position	Liquid assets to total assets ratio	+
vii) Liquidity risk	Total loan to total asset ratio	-
viii) Bank size (In TA)	Natural logarithm of total asset of a bank	+/-
ix) Net non-interest income ratio	Non-interest revenue less non-interest expense over total assets	+
x) Marginal cost	Ratio of percentage change in deposit over percentage change in interest	-
<i>Industry-specific variables</i>		
xi) Hirschman-Herfindahl Index (HHI)	Sum of square of market share is a proxy for market structure variable	+/-
<i>Macroeconomic-specific variables</i>		
xii) Bank spread	Difference between average lending rate and deposit rate of banks	+
xiii) Rate of inflation	Annual rate of inflation (%)	+
xiv) Growth rate of GDP	Real economic growth rate as a % change in GDP	-

ii) Equity position:

Equity over total asset ratio measures the capitalization of a bank. High level of capital indicates higher creditworthiness that can engage prudent lending and leads to enhance bank profitability. Again, well capitalized bank can absorb risk induced from greater risky assets. Finally, banks with more equity compare to total asset required to borrow less, which lessen cost and increase profitability. Hence, we expect positive relationship between equity position and the profitability of banks

iii) Total loan to total deposit ratio:

Asset–liability management of a bank is reflected with this ratio. Loan is considered as asset and deposit is considered as liability for the bank. Banks usually offer more loans to its customers, financed from deposits and other sources for increasing interest revenue. Even though there exists liquidity risk. We envisage positive influence of this ratio on bank profitability.

iv) Required reserve ratio:

This is the regulatory variable of the central bank to execute monetary policy i.e. a bank must hold a portion of its deposits which cannot be lent. Though it protects depositors from bank failure but there is a tradeoff between earning and the opportunity cost. It reduces earning from condenses loan capacity by keeping more amount from the deposit amount as well as induce opportunity cost to safeguard banks. Significant positive relationship between the required reserve ratio and the profitability of banks is envisaged.

v) Employee productivity:

Employee productivity is measured by the ratio of net profit over the number of employees. For stable and sustainable growth, the upward trend of employee productivity is must. Bank could earn more profit if the employees are well managed and utilized properly. In our study we assume positive relationship between employee productivity and bank profitability.

vi) Liquidity position:

Liquid asset over total asset ratio represents the capacity of an organization to mitigate its service debt and short-term liabilities. Sophisticated liquidity position lessens liquidity risk and the bank can avail profitable investment

opportunity by providing loan instantaneously. Thus, we anticipate positive relationship between liquidity and profitability.

vii) Liquidity risk:

Total loan over total assets ratio is used to measure liquidity risk of the bank. It reflects the asset-liability management of bank on profitability. Higher the ratio indicates that the bank is loaned up and liquidity is getting down. For low level of liquidity, the bank may face liquidity risk. To minimize this risk bank may induce higher funding cost for obtaining liquidity which in turn lowers profitability of the bank. So, we expect opposite relationship between liquidity risk and profitability of banks.

viii) Bank size:

Both economies and diseconomies of scale is captured by this variable. We measured bank size by taking the natural logarithm of total asset. Due to economies of scale growing bank size is positively related with the profitability of banks but for administrative complication, large banks might be incompetent and become unprofitable. Therefore, we cannot predict the impact of bank size on bank profitability.

ix) Net non-interest income ratio:

In our study, non- interest income includes various service charges, earning from leasing properties, penalty charges, capital gain form selling assets etc. Again, non-interest expenses include various types of overhead costs and operating costs. We calculate this ratio as net non-interest income (non-interest expense less non-interest revenue) over total assets based on studying

diverse literatures. We predict that net non-interest income will affect positively on bank profitability.

xi) Marginal cost:

Ratio of percentage change in deposit over percentage change in interest is used to calculate marginal cost of the bank. It is treated as a proxy to quantify the management efficiency on bank profitability. Better management can collect low interest bearing fund which can accelerate profitability of banks. A significant negative relationship is expected.

b) Industry-specific explanatory variable

xii) Hirschman-Herfindahl Index (HHI):

In our study we use Herfindahl-Hirschman Index (HHI) which is considered to be the more precise measure of concentration and competition as it takes into account all the companies in an industry. This index is commonly used in different empirical literatures (Gelos and Roldos, 2004; Uddin and Suzuki, 2014; Tan, 2016; Maji and Hazarika, 2018; Islam and Nishiyama, 2018). Some of which found positive and some of which found negative relationship between market concentration and profitability. HHI has been calculated as the sum of squares of individual bank asset's shares in the total banking sector assets in Bangladesh. The higher the value of HHI, the larger is the market concentration or low level of competition and vice versa. As we experienced both positive and negative association between concentration and bank profitability in diverse literature, we can't predict its impact in our study.

c) Macroeconomic explanatory variables

xiii) Bank spread:

The positive difference between interest charged against deposits and interest earned on its lending activities termed as interest rate spread which regulates banks' earning. Supplementary demand and providing better service for the accomplishment of loan triggered up interest rate for lending that ultimately increase bank spread. Therefore, we expect positive association between bank spread and profitability.

xiv) Rate of inflation:

Inflation reduces purchasing power of the money which persuades demand for money. As a result, banks can increase their interest margin by adjusting their interest rate to neutralize the inflation premium. So, our hypothesis is, banks' profit is positively related with the inflation rate.

xv) Growth rate of GDP:

We measure economic growth rate through gross domestic product (GDP) growth rate. It is the economic snapshot of a country which indicates how fast an economy is growing. Sound GDP growth makes sure that the economy is stable and as an entity of an economy bank reduces its' business risk which produce green pastures for the banks in case of financing. Based on this risk-return tradeoff we expect inverse relationship between economic growth and bank profitability.

3.3.4 Data source and sample description of the study

The bank level data have been obtained from the annual reports of different banks in Bangladesh. The macro level data have been obtained from Bangladesh Bank and Bangladesh Bureau of Statistics. We assessed the model using the STATA econometric software. Descriptive statistics of dependent and explanatory variables of the commercial banks of our study have been summarized in table 3.2.

Table 3.2: Descriptive statistics of the variables to assess market structure impact on profitability of banks in Bangladesh from 2007 to 2017

Variables	No. of Observation	Mean	Std. Dev	Min	Max
Dependent variable					
Return on asset (ROA)	531	0.0091	0.0200	-0.1400	0.1260
Independent variables					
<i>Bank specific variables</i>					
Expense management (EXMGT)	521	0.0525	0.0539	-0.2690	1.0720
Equity position (EQPN)	483	0.1560	0.4250	0.0018	6.2670
Total loan to total deposit (TL/TD)	516	0.9860	2.1030	0.0207	43.5030
Required reserve to total asset ratio (RQTA)	520	0.0417	0.0158	0.0006	0.3130
Employee productivity (EMPP)	450	828788.8	2015121	-7003003	23700000
Liquidity position (LA/TA)	519	0.1720	0.1900	0.0013	3.0670
Liquidity risk (LQRK)	517	0.6290	0.3380	0.0000	7.1790
Bank size (BS)	533	25.1700	1.1480	20.9300	27.8500
Net non-interest income ratio (NNIR)	519	0.0027	0.0479	-1.0210	0.1740
Marginal cost (MC)	473	-8.8060	752.7000	-12,313	9,902
<i>Industry-specific variables</i>					
Hirschman-Herfindahl Index (HHI)	627	0.0430	0.0067	0.0372	0.0592
<i>Macroeconomic-specific variables</i>					
Bank spread (SPD)	513	5.0660	0.3210	4.4400	5.5100
Rate of inflation (INF)	627	7.5280	1.5160	5.8300	10.6200
Growth rate of GDP	627	6.2890	0.5990	5.1000	7.2840

From table 3.2, we see that in Bangladesh the banks induced average return on assets is 0.91% with a standard deviation of 0.0200. Conversely, the target variable HHI induced a mean of 4.30%. Theoretically if the HHI index is below 10%, the banking

sector is neither extremely competitive nor concentrated which we have found in our study for the banking sector in Bangladesh. Table 3.3 illustrates the average and standard deviation (SD) of return on asset (ROA) of banks in Bangladesh in historical manner.

Table 3.3: Average and standard deviation of return on asset (ROA) of banks in Bangladesh for a period of 2007-2017

Year	Mean return on asset (ROA)	Standard deviation (SD) of return on asset (ROA)
2007	0.0079	0.0255
2008	0.0111	0.0126
2009	0.0114	0.0215
2010	0.0166	0.0115
2011	0.0114	0.0188
2012	0.0052	0.0271
2013	0.0047	0.0320
2014	0.0074	0.0188
2015	0.0101	0.0114
2016	0.0074	0.0151
2017	0.0082	0.0113

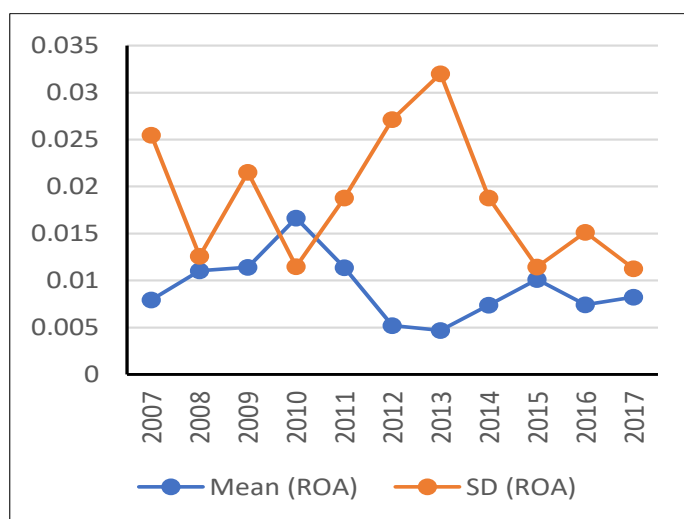


Figure 3.2: Trend of average return on asset (ROA) and its standard deviation (SD) of commercial banks in Bangladesh for period of 2007-2017

(Source: Annual reports of different commercial banks in Bangladesh)

From figure 3.2, we see that ROA was the highest in 2010 is around 1.6%. After that it was decreasing and fluctuated up to 2017. Regarding the standard deviation on ROA, we found that most of the cases are deviated from the mean but it was highly deviated in 2007 and 2013, which means the values are greater degree of extent from the mean during these two periods among the study period from 2007 to 2017.

3.4 Empirical consequence of the market impact assessment on profitability

The regression output of the empirical model in equation-1 using the fixed effect model estimator of the determinants of ROA of the banks in Bangladesh, has been presented in table 3.4. We run the model across several time periods to see the impact of financial variables as formed with the classification of bank specific, industry specific and macroeconomic specific variables on bank profitability measured by ROA. The value of $R^2 = 0.5068$, which indicates that the model estimators depict a good explanatory power of the independent variables.

Table 3.4: Determinants of return on assets (ROA) of banks in Bangladesh, 2007-2017

Variables	Coefficient	Drisc/Kraay S.E.	t-Statistics	p>t
Dependent variable				
Return on asset (ROA)				
Independent variables:				
<i>Bank specific variables</i>				
Expense management	-0.0398*	0.0217	-1.83	0.0730
Equity position	-0.0036	0.0022	-1.63	0.1100
Total loan to total deposit	-0.0001	0.0001	-1.12	0.2680
Required reserve to total asset ratio	0.0122	(0.0167)	0.73	0.4680
Employee productivity	0.0000**	(0.0000)	3.19	0.0020
Liquidity position	-0.0106***	(0.0027)	-3.94	0.0000
Liquidity risk	0.0005	(0.0004)	1.13	0.2660
Bank size	-0.0077**	(0.0024)	-3.29	0.0020
Net non-interest income ratio	0.0669	(0.0632)	1.06	0.2950
Marginal cost	-0.0000***	(0.0000)	-3.68	0.0010
<i>Industry-specific variables</i>				
Hirschman-Herfindahl Index (HHI)	0.2500	(0.2490)	1.01	0.3190
<i>Macroeconomic-specific variables</i>				
Bank spread	0.0167***	(0.0041)	4.11	0.0000
Rate of inflation	-0.00325***	(0.0006)	-5.40	0.0000
Growth rate of GDP	0.0060***	(0.0014)	4.15	0.0000
Number of observations		356		-----
Within R ²		0.5108		-----
Hausman test, 0 ² (P- value)		51.7700		0.0000
Driscoll and Kraay standard errors test, 02 (P- value)		153.3800		0.0000

Note: The above table reveals the regression output from the fixed effect estimation of the determinants of ROA. Coefficients which are significantly diverse from zero at the 1%, 5% and 10% level are marked with ***, **, * respectively. Hausman test confirms the justification of using fixed effect estimator. Driscoll and Kraay (1998) suggested a non-parametric covariance matrix estimator that constructs heteroskedasticity and autocorrelation consistent standard error (Driscoll and Kraay standard errors) that are strong to general forms of spatial and temporal dependence.

From the examination of the coefficients of bank specific variables, expense management, equity position, employee productivity, net non-interest income ratio and marginal cost were found statistically significant at 1% and 5% level of

significance. It is observed that expense management has a positive significant relationship with ROA at 5% level of significance. In our study 1% increase in expense management leads to 14.60 % bank profitability. According to Edwards and Heggstad (1973) hypothesis efficient expense management was shown to be most significant determinant of bank profitability. This positive impact can be in the form of hiring efficient managerial personnel by higher spending which induced more profit in banks. Efficient cost management reveals an established level of cost management. It may be advised that in Bangladesh, banks have achieved a maturity level where more expenditure may be related to create more profit.

Expense management has significant negative correlation with profitability which is in line with the study of Kosmidou et al. (2005) in UK banks. This negative correlation suggests that a rise in operating expense in relation to total assets would decrease bank profitability. This finding is also relevant with expense preference behavior theories of Edwards (1977). Banks should concentrate more on core banking activities to earn interest income by reducing operating expenses.

The efficiency of a worker is usually evaluated in terms of the output of an employee in a specific period of time which is termed as employee productivity. It indicates how much profit is earned by spending on an employee. In our study, there is a positive affiliation between employee productivity and ROA which is also statistically significant. So, it can be suggested that comprehensive training and development programs should be provided to employees with good organizational environment to equip them with the right skills so as to enhance their productivity and subsequently stimulate profitability of the bank.

Our empirical study shows that, bank size is significantly negatively affects profitability of banks at 5% level of significance. It implies that large size of the bank

is not contributing to the acceleration of profit which is similar with the study of Kasimodou et al. (2005) among banks in UK. Large banks cannot potentially increase profitability due to the diseconomies of scale. Lower administrative cost and the advantage of efficient management small banks exhibit better performance by providing higher profit.

We experienced an inverse relationship between liquidity and profitability of banks which support the tradeoff theory of liquidity and profitability. Holding more liquidity imposes opportunity cost on the banks. Keeping more liquidity bank has less amounts of money to invest. As result earning will be reduced as well as profitability will be declined. Our study findings is similar with the study of Abdullah and Jahan (2014).

Distinctive sources of noninterest income comprise of service charges on deposit accounts, securities transactions, trading account and credit fees have positive impact on bank profitability. Its importance is extremely growing which is observed by the study of DeYoung and Rice (2004). They found that 40% of operating revenue in the U.S. commercial banking industry makes up from noninterest income. We also diagnosed an opposite relationship between marginal cost and profitability which is also highly statistically significant. This means that reducing marginal cost enhance profitability which may also favor ESH. If a bank has a lower marginal cost, it can have a choice to decrease its price to gain more market shares. To find out the deterministic power of the market structure replacing by HHI on bank profitability is found to be positive but statistically insignificant in our study. It means that competition in the banking sector in Bangladesh does not have significant impact to enhance profitability.

Among the macro-economic variables, it is observed that bank spread has highly significant positive relationship with ROA. It means that banks charge higher interest

on loans and pay less on deposit to induce more bank spread which eventually gear up bank profitability. From the context of loanable fund theory, this could be interpreted as, the bank spread will be high if demand for loanable funds exceeds supply of loanable funds, i.e. surplus demand of loanable funds influence banks to possess higher lending rate. This implies that with the intention to generate more profit, banks will pursue to enhance net interest margin by increasing interest income (Musah et al., 2018). Again, inflation is negatively and highly significant with ROA i.e. if inflation increase profitability will decrease. This suggests that due to increase in inflation, cost of fund will increase which will ultimately reduce bank profitability. We also found positive and strongly significant correlation of GDP growth rate with the profitability indicator which confirms the positive impact of bank profitability on economic growth at 1% level of significance. It confirms the positive impact of the current level of bank profitability on economic growth. The justification is that confidence in economy may grow which might make businesses raise their bank borrowings. As a result, banks may have the scope to gain more from its lending activities.

3.5 Conclusion and suggestions of the study

To foster economic growth in a country, banking sector stability is considered to be the most important one. Now a day almost every bank has become all- purpose bank trying to make business in all areas in an economy. Our study assessed the influence of bank specific, industry specific and macroeconomic aspects on bank profitability in Bangladesh. Some useful visions are provided from this study that determines the profitability of banks.

Our study reveals that the banking industry in Bangladesh is moderately competitive and concentrated but insignificant influence on bank profitability. But some kind of

concentration is viewed in different functional areas which may invite instability in the long run. Inter-industry competition together with financial liberty seems to be the key drivers in the enhancement of rivalry in the banking sector.

Mostly the bank specific factors i.e., employee productivity have been deemed to be significantly positively associated to bank profits, whereas expense management, liquidity position, bank size and marginal cost have been found significantly negatively affecting bank profitability. Profit variable i.e. ROA also responds positively to GDP growth, signifying that banks make more profits during flourishing stages when the country offers better institutional environment. The consequence of inflation has been found to be negative which means that banks are unable to accelerate profit due to incurred higher cost during inflation.

It is also evident that banks may generate higher profit by abusing efficiency of scale, and offering products and amenities at a reduced price with modernized technology in a concentrated market although the number of market players in the bank industry is growing. Competition is virtually between aggressive and progressive phenomenon, where progressive is the desirable one. In our study, competition is present in terms of technology adoption in core banking operation which is a result of change in market force. For the developing countries like Bangladesh, there is a scope for rising competitiveness by averting disproportionate concentration.

From a policy perspective, to persist with a specific profit level within the industry, banks need to propose more expanded products and services to achieve competitive advantages. In Bangladesh, banks have been moving towards functioning efficacy by which managerial expertise can be achieved. Therefore, banks can afford to spend upon human capital which leads to accomplish higher profitability. Through the

enhancement of profitability banks can influence on financial stability and economic growth in Bangladesh.

Future researchers can examine the extension of the model by including some added explanatory variables like ownership structure, deposit insurance, asymmetric information, competition between private and state-owned commercial banks, competition among banks and DFIs in Bangladesh, deposit insurance etc. Owing to unavailability of the data and for the probable multicollinearity problem we could not have successful instinct of the literature but it could be a remarkable pathway for the upcoming research.

Appendix 2

In table 3.5 the correlation matrix demonstrates the degree of correlation among the dependent variable and the explanatory variables used in the regression analysis. The matrix represents a weak correlation among the independent variables. These pair wise correlation matrices are the STATA output and the abbreviated forms of table 3.5 stand for the elaborated names of the variables stated in table 3.2.

Table 3.5: Pair wise correlation matrix of the variables considered to impact assessment of the market structure on the profitability of commercial banks in Bangladesh

Variables	ROA	EXMGT	EQPN	TL/TD	RQTA	EMPP	LA/TA	LQ RK	BS	NNIR	MC	HHI	SPD	INF	GDP
ROA	1.000														
EXMGT	-0.116***	1.000													
EQPN	0.032	-0.110**	1.000												
TL/TD	0.238***	-0.145***	0.281***	1.000											
RQTA	-0.024	0.149***	-0.071	-0.188***	1.000										
EMPP	0.410***	-0.075	0.084*	0.043	-0.105**	1.000									
LA/TA	0.006	-0.108**	0.262***	-0.063	-0.137***	0.023	1.000								
LQ RK	0.038	0.064	-0.053	0.221***	0.218***	0.001	-0.170***	1.000							
BS	-0.015	0.078*	-0.534***	-0.150***	0.185***	-0.079*	-0.373***	0.095**	1.000						
NNIR	0.039	-0.814***	0.015	0.015	-0.041	0.056	0.016	-0.020	-0.005	1.000					
MC	-0.021	0.005	0.002	-0.007	-0.092**	-0.001	-0.005	-0.001	0.018	-0.011	1.000				
HHI	0.037	0.094**	-0.061	0.000	0.040	-0.086*	-0.054	0.074*	-0.269***	-0.065	-0.048	1.000			
SPD	0.023	0.172***	0.037	0.016	0.049	-0.125**	0.021	0.047	-0.152***	-0.047	-0.054	0.642***	1.000		
INF	0.000	0.138***	-0.037	-0.015	0.024	-0.107**	0.023	0.029	-0.111**	-0.075*	-0.016	0.297***	0.818***	1.000	
GDP	-0.065	-0.078*	-0.065	-0.043	-0.046	0.082*	0.019	-0.072*	0.190***	0.029	0.081*	-0.364***	-0.623***	-0.173***	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note:

- Output of Stata
- Refer to the table 3.2 of descriptive statistics for explanation of the terms of the variables

Chapter 4

Effect of Capital Conservation Buffer on Profitability: Dynamic Panel Evidence from Commercial Banks in Bangladesh

4.1 Introduction

Banks are generating reasonable proceeds in their usual process as defined by Saona (2011) through transferring funds from the savings units to the investing units of the society. At the present global proliferation, rapidly changing business environments, it is crucial to identify the issues to protect the banking industry from the various threats which they are exposed to, during accomplishing their tasks. For ensuring long-term sustainability micro-prudential policy need to be developed for the bank as they are not only a means for monetary control but also a powerful body to shakeup the economy as a whole. At this standpoint, like other profit making organization the significance of capital on bank profitability is needed to be highlighted.

As the extent of capital enhances both worthwhile and adverse effects on bank profitability the association between bank capital and profitability has develop a basis of concern to the stakeholders of bank (Lee and Hsieh, 2013). A well-capitalized bank may anticipate higher returns due to lower bankruptcy costs. Moreover, banks might be motivated to preserve higher capital ratios to indicate better performance in future (Berger, 1995a). A high capital ratio signifies a high bank creditworthiness, which contributes to upsurge performance by reducing risk Tan (2016). For an undercapitalized bank, equity holders are unwilling to contribute more capital, as the yield would be reimbursed to the creditors. A flimsy banking system may threaten

the stability of the economy. Conversely, preserving minimum capital requirement as a control mechanism noticeably determines the capital structure and the performance of a bank which in turn influence on bank profitability.

In 1988, a committee was formed at Basel in Switzerland of G-10 countries namely Basel Committee on Banking Supervision (BCBS). The first multinational accord Basel I was settled to standardize the measurement of bank's capital adequacy by this committee. This accord focused on the amount of a bank's capital in relation to the amount of risk it is taking for strengthening financial stability of the bank throughout the world. In 2004, to overcome the shortfalls of Basel I accord the committee announced Basel II accord with a marked improvement of the prudential framework by comprising three pillars of (i) minimum capital requirements, (ii) supervisory review of an institutional capital adequacy and internal assessment process, and (iii) pragmatic use of disclosure as a way of strengthening market discipline and encouraging sound banking practices. The basic limitations against this accord appeared to the rest on its pro-cyclicality on the ground that it may make business cycle much more pronounced, can create hindrances for the policy makers and the economic stability as well. In order to develop the quality of regulatory capital and significantly improve the financial stability and proper treatment of liquidity risk Basel III has come up in 2010 with new capital and liquidity regulations. Basel III accord also augments the risk based capital requirement with leverage ratio of 3% and reduces procyclicality and promotes countercyclical buffers in regulatory capital.

Prudential regulations relating to control risks and hold adequate capital Basel III enhanced the macro prudential characteristics namely the capital conservation buffer (CCoB) and the countercyclical buffer. This buffer capital intends to safeguard the banking sector from stressed situations and profitable situation.

Capital conservation buffer is a macroprudential capital adequacy requirement for the banks to build up an additional 2.5% of a bank's total exposures entirely out of tier I capital to expand the resilience to stresses. The buffer sits on top of the 4.5% minimum requirement for common equity tier 1 capital (CET-1) with the goal to conserve a bank's capital. Countercyclical buffer refers to the strategy enacted by the government against the ongoing boom or recession trend to stabilize the economy. The national authorities endorse this buffer when the excess credit growth potentially indicates a threat of financial distress.

Due to underdeveloped financial systems and susceptibility to volatile international capital flows emerging economies face countless survival challenges, particularly sudden withdrawals or reversals of capital inflows (Kawai and Morgan, 2012). This vulnerable condition can be reduced to succumb financial shock by adhering to adequate capital regulations. Since 1996, Bangladesh Bank (BB), the central Bank in Bangladesh, adopted a risk-based capital regulation for Bangladeshi commercial banks in line with the guiding principle of Basel accord. Risk-based capital regulation has been revised now and then by BB to bring up to date according to the amendments in the Basel accords. Still now the impact of capital regulation on bank profitability is under a matter of debate.

The present study is a modest attempt to investigate the impact of buffer capital on the profitability of 58 commercial banks in Bangladesh after governing the influences of some bank-specific and macro-economic factor. The specific purpose of the study was (i) to investigate whether the Bangladeshi commercial banks' capital buffers are sensitive to changes in capital regulation consistent with the Basel III accord and (ii) to assess the induced changes in bank capital buffers which affects the profitability of Bangladeshi commercial banks. Along with this, the study also perceives some

empirical evidence which is a valuable addition to the debate about the pro-cyclicality of the new capital accord.

4.2 The literature of the effect of capital conservation buffer on bank profitability

For a commercial conservation enterprise and related investment financing, conservation capital is a frontrunner in promptly developing field. Through capitalization and improved competent financial intermediation bank can improve its performance by ensuring profitability and shock absorbing capacity. There are a number of theories which seeking to clarify the nexus between bank capital requirement and profitability. Nevertheless, this study premised on the buffer theory of capital adequacy. On a study for a period of 2000-2007 in Japan by using 2SGMM and fixed effect regression model, Liu and Wilson (2010) found that higher bank capital contributes to lower credit risks and vice-versa. Referring to the developing nation, Balin (2008) pointed out that Basel I & Basel II overlook the consequence of implementation on the emerging market economy. He argued that the developing nations are still facing some complications especially in case of smaller banks. To cope up with the advanced approaches of Basel I accord small banks become more sick and larger banks will be in more risk to transform market from emerging to be a developed one. Keeping this in mind, Basel II presented a unique III Pillar approach concentrating on Pillar I – operational, market and credit, Pillar 2 emphasizes with supervisory review process by the central bank and Pillar 3 featured on the need for market discipline and disclosures. To shrink any excess cyclicality of the minimum capital requirement for conserving capital to build buffers this approach will be used for stress management at individual. Karacadag and Taylor (2000) performed a research to establish an association amongst the revised capital regime and the Basel

doctrine. The latest generation of Basel III presented some modifications in view of the strict capital requirements, liquidity and leverage ratios. This approach suggested to increase the minimum common equity requirement from 2% to 4.5%. Furthermore, banks are required to hold capital conservation buffer of 2.5% to endure future stress and bring the total common equity requirements to 7%. The motive of conservation buffer is to absorb losses during periods of financial and economic stress. This rule ensures correction of the pro-cyclicality of Basel II particularly in phases of economic growth. But Blundell-Wignall and Atkinson (2010) mentioned numerous shortcomings with the Basel III framework, portion of which are entrenched in Basel II.

4.2.1 Nexus between capital and profitability

There are a number of theories which elucidate the link between bank capital requirement and profitability. Capital is considered to be strongly positively related with profitability of banks (Berger, 1995a; Jacques and Nigro, 1997; Demirgüç-Kunt and Huizinga, 2000; Rime, 2001). Using GMM estimation with the data from the period of 1989 to 2005 in Africa Naceur and Omran, (2011) found that bank capitalization has a significant positive consequence on profitability. With the increase in bank capital, the default probability of bank becomes implausible, and the banks are considered protected. Chiuri et al. (2002) found from OLS panel regression analysis that higher capital requirement induces a lessening in bad loan supply which foster profitability. On macro perspective the relationship between capital and profitability is significantly related to the market structure which refers to the degree of market concentration within an industry. Heggstad and Mingo (1977), Short (1979), and Akhavein et al. (1997) found that, when competition is less in a concentrated market firms tend to have greater extent of operation, and in turn leading

to earn more profits. Related internal control variables like loan loss reserves to gross loans, liquid assets to customer and short-term deposits are positively related to profitability as observed by Casu and Girardone (2006), Short (1979) and Smirlock (1985). Considering the data from 1995–2001 in Europe fixed effects regression output exhibited that capital is positively related to profitability and governs the most significant determinant of profitability (Pasiouras and Kosmidou, 2007). A strong positive relationship between capital and earnings was found by Berger (1995b). A research work for the period of 1992–1998 on six major European banking sectors demonstrated a positive relationship persist between capital-assets ratio and profitability (Goddard et al., 2004b). A study performed among 15 European countries regarding the relationship between regulatory capital ratios and bank profitability, established a significant positive relationship between these two concerns (Iannotta et al., 2007). Similar study was accomplished on banks from Asian countries and found that capital ratios are positively correlated with bank earnings (Lee and Hsieh, 2013).

Contradictory relationship also observed from various research works. Incompetent European banks appear to grip more capital (Altunbas et al., 2007). An inverse relationship between the ratio of liquid assets to total assets and profitability is observed in Russia (Fungacova and Poghosyan, 2011). Banks with more liquid assets generally have smaller target capital buffers (Jokipii and Milne, 2011). A study on eight European countries found a negative association between capital and profitability ratios (Goddard *et al.*, 2013). Some studies also found mix results. A study of some African banks found to be positive relation between regulatory capital and profitability for listed banks and adverse impact on non-listed banks (Ozili, 2017). The opponents of the regulation contended that holding higher capital would threaten

to the banks' ability to lend and would adversely affect the economic output (Slovik and Cournede, 2011).

Based on the research query about the impact of strict capital requirements on the bank profitability in Bangladesh we examined the impact of capital regulation on bank profitability along with the studies of Casu et al. (2017) among Asian banks, Naceur and Kandil (2009) among Egyptian banks, Goddard et al. (2013) and Altunbas et al. (2007) among European countries, and Ozili (2017) among African banks. From these studies, it may be inferred that the association between bank capital and profitability is occasionally positive or negative or mixed.

4.2.2 Capital buffer and cyclicality in bank

Cyclicality of bank capital can be defined as the co-movement of business cycles and bank capital. Procyclical represents a condition of a positive correlation between an economic indicator and the overall state of the economy and a counter-cyclical policy embodies a strategy by the authority to counter boom or recession through financial measures. It works against the ongoing boom or recession trend, trying to stabilize the economy. Positive co-movement infers counter-cyclicality and negative co-movement represents procyclicality. Thus, to have counter-cyclicality between bank capital buffers and the business cycle, capital has to be accumulated in booms and lower in depression. The buffer (additional capital) is the size of the capital cushion that above the regulatory capital requirement.

The impact of stringent capital regulation on bank profitability is confusing. By reducing debt in the capital structure higher capital may negatively affect bank profits for tax shield provided by the deductibility of interest payments on the debt. Banks can decrease risk weighted assets to enhance capital adequacy ratios which may

reduce bank profits (Ashraf et al., 2016). A study on Western European banks found a negative co-movement of capital buffers and the business cycle (Lindquist, 2004; Jokipii and Milne, 2008; Stolz and Wedow, 2011). By decreasing operating costs, rearranging business activities, monitoring bank loans and regulating poor credit quality loans may encourage banks to be efficient for approving rigorous capital regulation (Santos and Elliott, 2012). Cyclical behavior of bank capital buffers differs in accordance with the size, the type of bank, financial infrastructure and regulatory environment of the country. The negative co-movement between capital buffer and business cycles can aggravate the procyclical impact of Basel regulation and emphasize the need for capital provisioning during positive economic growth (Shim, 2010). Capital buffers may be treated as protection against failure to meet capital requirements (Lindquist, 2004).

4.2.3 Implementation of Basel accord in Bangladesh

According to Muller (2018) 80% of the world population is living in emerging economy and 59% of the global GDP (based on PPP-adjusted USD) is represented there. We consider Bangladesh as an emerging economy and that is why we performed our study about banking sector of this country. In 1971, only four domestic national banks: Sonali Bank, Agrani Bank, Rupali Bank, and Janata Bank were there in Bangladesh. Only three foreign banks and no private banks were there at that time (Alam and Riyadh, 2003). It was growing in 1980s when the private commercial banks were permitted to operate. Presently, banks of Bangladesh are mainly of two types: (i) scheduled banks which are operating under Bank Company Act, 1991 (Amended up to 2013) and (ii) non-scheduled banks that are established for specific and certain objective and operate according to the acts enacted for meeting up the goals. To safeguard the financial stability, the guidelines on risk-based capital

adequacy for banks in Bangladesh, has to preserve the minimum capital requirement or capital adequacy ratio at 10% of the risk weighted assets or 4000 million Taka in capitals, whichever is higher.

This research work set forth from the literature on capital buffers in numerous ways which comprehensively address the related issues to capital buffers in Bangladesh context. Zheng et al. (2017) found in his study for a period of 2000-2015 in Bangladesh that higher regulatory capital ratios enhance bank profitability. But it is observed from the preceding literature that the banking sector of advanced countries is steadier than emerging countries (Beck and Rahman, 2006; Sufian and Habibullah, 2009a; Uddin and Suzuki, 2011). The implementation process of Basel III in the developing economy in Asia is still on process. In Bangladesh, Basel I and II had been implemented in 1996 and 2010 respectively. At first, on March 31, 2014 Bangladesh Bank (BB) declared a roadmap for the execution of Basel III accord. On December 21, 2014, a revised guideline up to 2020 has been circulated by the BB. Phase wise arrangements of the implementation of Basel III in Bangladesh according to the BRPD Circular No -18, dated December 21, 2014 is shown below in table 4.1.

Table 4.1: Phase wise implementation plan under Basel III

Transitional Arrangements	Beginning of						
	2013	2014	2015	2016	2017	2018	2019
Minimum common equity capital ratio	3.5%	4.0%	4.5%	4.5%	4.5%	4.5%	4.5%
Minimum tier 1 capital	4.5%	5.5%	5.5%	5.5%	6.0%	6.0%	6.0%
Conservation buffer				0.625%	1.25%	1.875%	2.5%

Source: Basel Committee on Banking Supervision

To implement Basel III accord in Bangladesh, the main challenge is the countercyclical capital buffer which will stuck between 0 to 2.5 per cent in excess of minimum capital-tier 1 capital (composed of common stock, retained earnings and

reserves). This measure applies only to protect the financial system against systemic risks associated with unsustainable credit growth. The changes of Basel II and Basel III are depicted in figure 4.1.

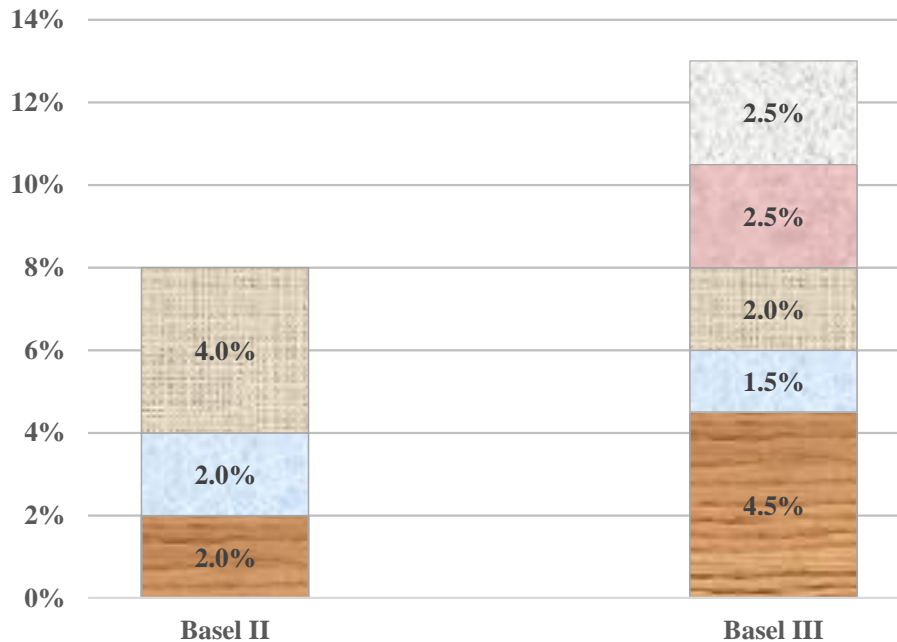


Figure 4.1: The changes of Basel II and Basel III (Source: Basel Committee on Bank Supervision)

4.3. Methodological issues of the study

This study comprises both quantitative and qualitative analyses, examines the rules and regulations related to capital adequacy, outlined by Bangladesh Bank in relation with profitability concern. In case of panel data analysis with a dynamic model, standard OLS is inappropriate since the projected value of lagged coefficient is upward biased owing to the correlation between the lagged dependent variable and the fixed effects (Nickell, 1981). Again, conventional OLS analysis in short level on the relevant lagged term blows out yield coefficients with some erroneous signs and erroneous size (Driffill et al., 1998).

In such circumstance, the GMM established by Arellano and Bond (1991), is considered better. This method also assists to regulate potential endogeneity between variables and particularly be compatible to deal with short macro panels and is also supportive in adjusting the bias induced by omitted variables in cross-sectional estimates. For this reason, we prefer not to use the POLS model in our study. Furthermore, fixed effect model is the best for regression analysis and also for variance where the number of independent variables is fixed and all the variables are represented in ratios. Hausman test has been performed to settle down to settle the best model between the fixed effect model and the random effect model for equation 1. The outcome of the test confirms that the fixed effect model is appropriate for our study variables³.

The study applies Driscoll and Kraay standard errors which suggested a non-parametric covariance matrix estimator that hypothesises heteroskedasticity and autocorrelation consistent standard error that are robust to general forms of spatial and temporal dependence (Driscoll and Kraay, 1998). Time series data analysis has also been performed to demonstrate the trend of significant variables in our study.

³ The relevant Hausman test chi-squared statistics is $\chi^2(13) = 398.63$ with p-value of 0.0000

4.3.1 Diagnostic test

In table 4.2, VIF test has been accomplished to diagnose the multicollinearity problem among response variables of the study. It reveals that VIF for every independent variable is less than 10 and average is less than 2 that indicates that multicollinearity problem is not present in our study.

Table 4.2: Test of multicollinearity of the bank specific variables of the study

Variables		1/VIF
i. Buffer capital in relative term	1.02	0.9801
ii. Internal capital generation rate	1.35	0.7416
iii. Financial intermediation	1.09	0.9210
iv. Non-performing loan	1.25	0.8013
v. Implicit cost	1.05	0.9553
vi. Income diversification	1.07	0.9364
vii. Management efficiency	1.44	0.6951
viii. Regulatory capital buffer	1.03	0.9749
ix Bank size	1.26	0.7917
Mean VIF		1.65

4.3.2 Econometric model

The dynamic panel data, the econometric approach to estimate the model that demonstrates the relationship between bank capital and profitability will be as in the following linear form:

$$\pi_{it} = \alpha + \sum_{j=0}^j \beta_j X^j_{it} + \sum_{l=0}^l \beta_l X^l_{it} + \sum_{m=0}^m \beta_m X^m_{it} + v_{it} + \mu_{it} \text{ ..Equation-1}$$

where π indicate the profitability of bank i at time t represented ; where $i = 1,2,3,\dots,N$; $t=1,2,3,\dots,T$ and α is a constant term. The superscripts j , l and m of X_{it} denote bank

specific, industry specific and macroeconomic determinants respectively. v_{it} and μ_{it} are the unnoticed bank specific effect and the idiosyncratic error.

4.3.3 Empirical determinants to assess the effect of capital conservation buffer on bank profitability

To explore of the effect of capital conservation buffer on commercial banks' profitability in Bangladesh, a panel regression has been estimated in 3 models having measure of profitability by ROA, ROE and NIM. Thus, these are considered as dependent variables along with the set of bank specific variables, industry specific variables and macroeconomic indicators as independent variables. Table 4.3 demonstrates the descriptive statistics of the response variables castoff in our study.

4.3.3.1. The dependent variables

We considered return on asset (ROA), return on equity (ROE) and net interest margin (NIM) as the profitability indicators of banks in Bangladesh. ROA signifies the extent of profitability of a company to its assets depending on the effective utilization of its asset to produce earnings. ROE symbolizes the measure of profitability of an organization with regard to its stockholders' equity. NIM measures the interest earning spread of a company on its investing acts as a percentage of total interest earning assets. We try to catch on the significant influence of bank-specific, industry-specific and macroeconomic variables on these three profitability indicators.

Table 4.3: Explanation of the variables of the study regarding capital conservation buffer effect on bank profitability

Variables	Description	Expected Effect
Dependent variables to measure profitability		
Return on asset (ROA)	Net profit to total assets ratio	
Return on equity (ROE)	Net profit to shareholders equity ratio	
Net interest margin (NIM)	Net interest income to interest earning assets ratio	
Independent variables		
a) Bank-specific variables		
i. Buffer capital in relative term (BCRT)	Ratio of (capital adequacy ratio-required rate) / required rate	-
ii. Internal capital generation rate (ICGR)	(1/Capital ratio) x ROA x earnings retention ratio	+
iii. Financial intermediation (TL/TD)	Total loan to total deposit ratio	+
iv. Non-performing loan (NPL/TL)	Non-performing loan over total loan (%)	-
v. Implicit cost (IMPCOST)	Non-interest expense over non-interest income (%)	-
vi. Income diversification (INCDIV)	Non-interest income over total revenue (%)	+
vii. Management efficiency (MGTEFF)	Interest earning asset over total asset (%)	+
viii. Regulatory capital buffer (RCB)	(Total equity over risk weighted asset) - minimum regulatory capital	+/-
ix Bank size (In TA)	Natural logarithm of total asset of a bank	+/-
x Tier 1 leverage (TILEVG)	Tier 1 capital over total asset (%)	+
xi Dummy variable (DRCAP)	Dummy variable that takes 1 over 2015 and subsequent year and 0 before.	+/-
b) Industry-specific variables		
xii. Herfindahl- HHI Hirschman Index (HHI)	Sum of square of market share is a proxy for measuring market concentration	+/-
c) Macroeconomic variables		
xiv. Term interest rate spread	Difference between the cut off yield spread of 10 year and 5 year treasury bond (%)	-
xv. Inflation rate (%Inf)	Annual rate of inflation (%)	+
xvi. GDP growth rate (% GDP)	Real economic growth rate as a % of GDP	-

4.3.3.2. The independent variables

(a) Bank-specific explanatory variables

i) Buffer capital in relative term:

Different capital ratios are considered in Basel I requirement subject to the type of disclosure. The aim of the new accord of Basel Committee is to connect capital requirements to minimize risk. Depending on the risk profile of diverse portfolios, banks themselves might vary their buffers capital. Buffer capital in relative term, indicate that the banks clutch capital buffer above the minimum requirement by the domestic regulation. If capital requirements increase, banks would have to reduce their loans and subsequently credit squeeze would reduce profit of the bank. Due to the probability of fluctuation of business cycle, buffer capital in relative terms is therefore expected to be negatively linked with bank profitability.

ii) Internal capital generation rate:

This ratio is calculated by considering the three issues as such, capital ratio is total equity divided by total asset, return on asset is net income after taxes divided by total assets and the earning retention ratio is calculated as net income available to shareholders minus dividend divided by net income available to shareholders (Kolari et al.) This is a useful tool of maintaining adequate level of capital. The higher capital requirement as suggested by Basel III accord to meet any financial shock increases the role of internal capital generation rate. We expect a positive correlation between internal capital generation rates with the profitability of banks.

iii) Financial intermediation:

It constitutes the ratio of total loan over total deposit which is included in our model to demonstrate the competence of the bank to accelerate its loan disbursement activity

form its customer's deposited amount. According to Zheng et al., (2017) higher ratio of financial intermediation would increase banks profit as well as indicate high capital conservation. Therefore, we expect a positive correlation between financial intermediation and bank profitability.

iv) Non-performing loan:

The ratio of non-performing loan over total loan is used in our model as a proxy variable to measure credit risk revelation of a bank. The bank capital buffers are maintained to endure contemporary unanticipated shocks as well as to cover future problem loans. As suggested by the regulatory bodies and to uphold the quality of assets, banks give attention to keep lower level of non-performing loan to enhance its profitability. As such, we predict an inverse relationship between non-performing loan and bank profitability.

v) Implicit cost:

The implicit cost of the bank is measured by the ratio of non-interest expense over non-interest income. Non-interest expenses include employee salaries, rent, postage and stationary etc. On the other hand non-interest interest income includes sale of assets, leasing of property, earning from providing services and penalty charges etc. In a study of Naceur and Kandil (2009), authors showed that the higher the ratio of implicit cost lower the profit. Thus, we expect opposite affiliation between implicit cost and bank profitability in our study.

vi) Income diversification:

This variable is calculated by non-interest income over total revenue. It means that a part of revenue engendered from the activity other than interest bearing investment. Banks that have more sources of revenue can increase efficiency through diversifying

risk and increase profitability. Tan and Floros (2013) stated that an efficient bank can induce more revenue by engaging diversified business activity. They also found positive implication of income divergence on bank profitability. In our empirical model of bank profitability, we expect a positive association between income diversification and banking profit.

vii) Management efficiency:

This variable is measured by the ratio of interest earning asset over total asset. An efficient management can do well management of a firm's capital by reducing cost of intermediation. As managers strive to generate more profit by doing skillful allocation of fund, we predict positive impact of management efficiency on bank profitability.

viii) Regulatory capital buffer:

It is characterized as the deference between (total equity over risk weighted asset) - minimum regulatory capital. In line with Basel III accord, Bangladesh bank guideline (2014) on capital adequacy is that all the commercial banks in Bangladesh should maintain a minimum total capital ratio of 10% (or minimum capital plus conservation buffer of 12.5%) by 2019. Therefore, we consider minimum regulatory capital as 10%. The objective of introducing this regulatory capital is to enhance the stability of banks and protecting against the insolvency during the stressed period. The buffer course of action is accomplished to act as counter-cyclical manner to the credit cycle as well as this capital requirement also create credit crisis. Usually retained earnings are become used to increase capital buffer, that is, changes in capital buffer have a positive impact on bank profitability. Again higher profits replicate high charter value. Therefore, high profit banks required to hold lower capital buffer. Hence, we consider this variable with an ambiguous expected sign.

ix) Bank size:

Bank size (size) is measured with the natural logarithm of total assets of each bank. Large banks enjoy the economies of scale, for which they can charge lower margin on loans. According to the proposition of “too big to fail” well diversified, highly levered and securitized banks are more impulsive in return (Drakos et al. 2016). Again, large banks hold the monopoly power which empowers them to charge higher margin. They have the lower possibility of a large negative shock to their capital. As a result, they only need to carry a lower capital buffer as insurance to face such a shock. In the viewpoint of systematic risk, bank size is proportional to the risk. Goddard et al., (2004) argued that performance of the bank initially increases with size but due to bureaucratic reasons deteriorates in future. Therefore, there is no former expectation of the relationship between bank size and profitability.

x) Tier 1 leverage:

Tier 1 capital over total asset ratio represents variable tier 1 leverage. This ratio is used to measure the quality of the capital comprising of equity capital and retained earnings which is the principal funding source of banks. To be an adequately capitalized bank, the tier 1 leverage ratio should be 3% to 4%. Both positive and negative evidence were experienced in different studies. Berger (1995) conducted a study on US commercial banks and noted that tier 1 capital had a positive impact on bank profitability, whereas Goddard and Assad (2006) found reverse relationship between tier 1 capital and profitability. Hence, we consider the first one and expect positive association between tier 1 capital and bank profitability.

xi) Dummy variable:

We include a dummy variable to ascertain the effects of executing Basel III accord. Dummy variable, that takes 1 over 2015 and subsequent year and 0 before, as Basel III accord was implemented in Bangladesh since 2015. We postulate a statistically significant coefficient of this variable.

b) Industry-specific variables

xii) Herfindahl-Hirschman Index (HHI):

It accounts the sum of the squares of all banks market shares concerning banks total assets in a country Bikker and Haaf (2002). We used a Herfindahl-Hirschman Index as a proxy to measure the competition and concentration in the market. High concentration indicates higher market power as well as low competition and vice versa. According to Claessens and Laeven (2004) high market power require less capital ratio which tends to increase high degree of profit. Again, in a competitive atmosphere, managers offered more incentives to enhance efficiency which triggered up profitability of banks Tan (2016b). In these controversial circumstances, we do not have any prior anticipation on the sign of this variable in our equation.

c) Macroeconomic variables

xiv) Term interest rate spread:

This spread is calculated via the difference between the cut off yield spread of 10 year and 5 year treasury bond in Bangladesh to capture the shockwaves on the term structure of interest rates. Maturity gap management is a significant aspect for the bank management due to interest rate sensitivity. In a competitive capital market, bank has to compete with the government for accumulating fund. To survive within

the competition, banks consider lower lending rate. Therefore, we expect inverse relationship between term interest rate spread and profitability.

xv) Inflation rate:

As a macroeconomic variable we include annual inflation rate in our model. The higher the rate of inflation triggered the interest rate higher. In case of long-term lending, bank will change their interest rate to compensate inflation premium which will increase net interest margin (Tarus et al., 2012). So, we hypothesize positive association between inflation rate and bank profitability.

xvi) GDP growth rate:

GDP growth rate is used to measure economic development (Hassan et al., 2011). We consider this variable in our model to estimate the impact of economic growth onto bank profitability considering the capital conservation buffer. In case of economic upturn bank's lending activities increases by which banks generate more net interest income. Low level of buffer capital is accounted during higher GDP growth. But in case of economic recession where GDP growth is low higher level of buffer capital is required. Banks adjust buffer capital to reduce risk and to generate adequate level of profit. Thus we expect converse relation between GDP growth rate and Bank profitability.

4.4 Data source and sample description

The present study is predominantly on the basis of secondary data set due to the nature of the research. The sample banking data includes 57 commercial banks, over the period 2007-2018 of Bangladesh. Finally, sample of 495 bank-year observations have been considered for the study. Data have been collected mainly from the published annual consolidated financial statements of different banks' annual reports

along with the websites of banks. Macroeconomic and industry-related data have been taken from Bangladesh Bank and Bangladesh Bureau of Statistics. Extensive study has also been carried out of different journals, books, and online sources. Summary statistics of the variables taken into account in the present study to assess the effect of capital conservation buffer on the commercial banks' profitability in Bangladesh have been presented in table 4.4.

Table 4.4: Summary statistics of the variables of capital conservation buffer model (2007 to 2018)

Variables	No. of Observation	Mean	Std. Dev	Min	Max
Dependent variable					
Return on asset (ROA)	579	0.0136	0.1181	-0.1405	2.810972
Return on equity (ROE)	583	0.2801	1.0806	-18.2971	7.584654
Net interest margin (NIM)	584	0.0921	0.6642	-3.8811	10.80692
Independent variables					
<i>a) Bank-specific variables</i>					
i. Buffer capital in relative term	568	0.5280	5.5130	-11.0100	91.2800
ii. Internal capital generation rate	564	-6480.66	119222.6	-2796158	64.2600
iii. Financial intermediation	573	1.0640	2.5710	0.0207	43.5000
iv. Non-performing loan	549	0.1390	0.4020	0.0000	7.5000
v. Implicit cost	581	-5.3760	15.5600	-263.4000	2.6570
vi. Income diversification	581	0.1990	0.3060	-5.5570	0.9960
vii. Management efficiency	574	0.8590	0.5590	0.0162	7.3220
viii. Regulatory capital buffer	512	1.0130	10.5200	-0.0999	221.3000
ix Bank size	581	25.2100	1.1690	20.93	27.9000
x Tire 1 leverage	535	118.8000	815.7000	-101.6000	12,588
xi Dummy variable (capd2015)	684	0.7500	0.4330	0.0000	1.000
<i>b) Industry-specific variables</i>					
xii. Herfindahl-Hirschman Index (HHI)	684	0.0430	0.00640	0.0372	0.0592
<i>c) Macroeconomic variables</i>					
xiv. Term interest rate spread	684	1.1430	0.4410	0.2800	2.2500
xv. Inflation rate	684	7.3470	1.5710	5.3500	10.6200
xvi. GDP growth rate	684	6.4210	0.7200	5.1000	7.8640

From table 4.4, we observe that in Bangladesh for a period of 2007 to 2018 banks produce average ROA of 1.36%, ROE of 28.01%, and NIM of 9.21% with standard deviations of 11.81%, 108.06% and 66.42% respectively. It means that enough deviations persist in the profitability of banks in Bangladesh. Among bank-specific variables average internal capital generation rate, implicit cost, regulatory buffer capital and tier 1 leverage are highly deviated as measured by the standard deviation which points out very poor capability to endure. Judicious lending can play a vital role to overcome this situation, otherwise it will produce risk of existence. Industry variable in our study, HHI average is 0.0430 with a standard deviation of 0.0064. In theory, HHI value range of 0 to 0.10 indicates highly competitive market (non-concentration) where the clients hold more power in the industry. As a result, interest rate will get down and profitability will be compressed. But we experience moderate degree of competition in our study period. In macroeconomic variables, GDP growth rate fluctuates from 5.1 to 7.86 with an average value of 6.42. Mean value of inflation and term interest rate spread are 7.35 and 1.14 respectively with a lowest and highest value of 5.35 and 10.62 for inflation and 0.28 and 2.25 for the term interest spread during the study period.

Table 4.5 illustrates the average value of ROE, ROA and NIM and buffer capital in relative term (BCRT) which are to be considered as significant variables in our study.

Table 4.5: Year on year average ROE, ROA, NIM and BCRT of banks in Bangladesh from 2007-2018

Year	Mean Return On Equity (ROE)	Mean Return On Asset (ROA)	Mean Net Interest Margin (NIM)	Mean values of Buffer capital in Relative Term (BCRT)
2007	-0.0665	0.0079	0.0422	0.0431
2008	0.4416	0.0111	0.0362	0.0582
2009	0.6181	0.0114	0.1832	0.0391
2010	0.5259	0.0166	0.2605	-0.0676
2011	0.3765	0.0114	0.0638	0.1408
2012	0.1687	0.0052	0.0370	-0.1005
2013	0.1760	0.0047	0.0764	2.7204
2014	0.2059	0.0074	0.0231	1.8377
2015	0.3287	0.0101	0.0234	0.1941
2016	0.1807	0.0074	0.0402	0.4728
2017	0.2623	0.0082	0.0284	0.2605
2018	0.2096	0.0632	0.0407	-0.0511

Figure 4.2 produces the STATA output of time series analysis based on the above data which reveals the trend of predictor variables i.e. ROA, ROE and NIM used as proxy to measure profitability of banks and the buffer capital in relative terms within the study period (2007-2018). The three profitability indicators give different degree of extent during the time span of the study. The graph of buffer capital in relative term shows that maximum buffer capital was required during the period of highest divergent in ROE and ROA. NIM growth in 2011 and 2013.

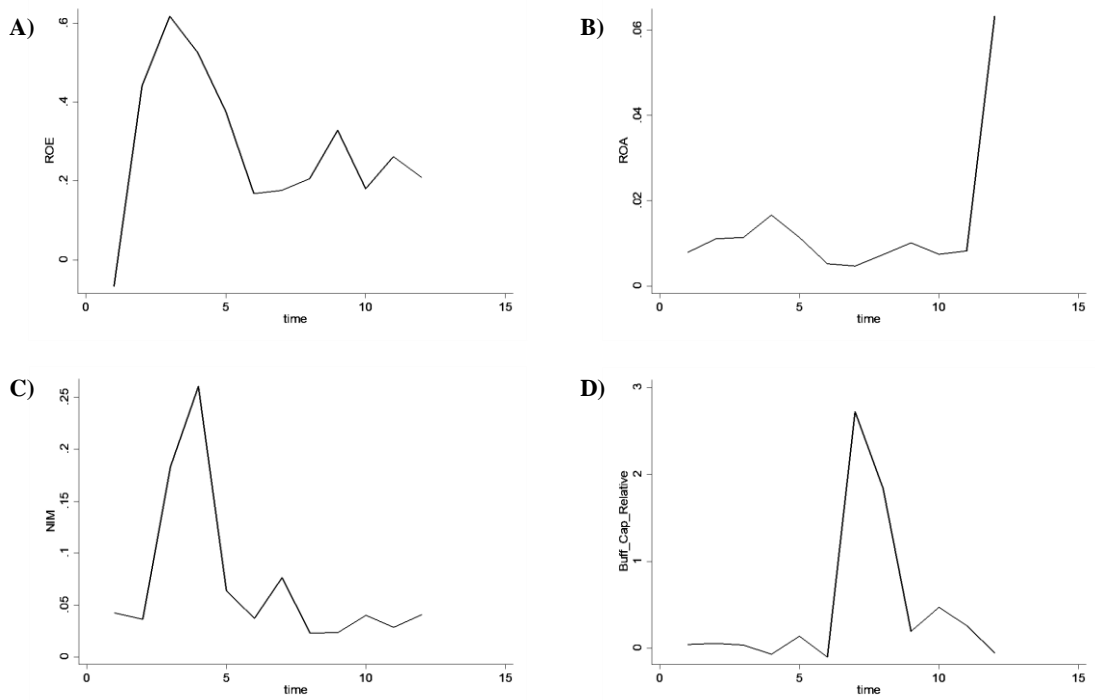


Figure 4.2: Time series analysis output of the trend of average values of i) ROE, ii) ROA iii) NIM and iv) buffer capital in relative term (BCRT) of commercial banks in Bangladesh from 2007 to 2018 (Source: Annual reports of different commercial banks in Bangladesh)

4.5. Benchmark result

Hausman test is accomplished to justify the use of fixed effect estimator. To construct heteroskedasticity and autocorrelation consistent standard error Driscoll and Kraay (1998) standard error was used in our model which suggests strong forms of spatial and temporal dependence. Particularly when the regression residuals are cross-sectionally dependent, Driscoll-Kraay standard errors are well adjusted.

Table 4.6 depicts the equation-1 consistent regression output of the empirical model of our study with the fixed effect model estimator of ROA, ROE and NIM which are used as proxy variables to measure profitability of the commercial banks in Bangladesh. The p-value of the F-test in the model is less than the significance level

at 1%, 5% and 10% which means that the sample data in our study provide sufficient evidence regarding the best fit of the model.

Table 4.6: Outcome of the fixed-effect model to assess the effect of capital conservation buffer on bank profitability in Bangladeshi commercial banks from 2007 to 2018

Dependent variables	ROA	ROE	NIM
Constant	0.4130 0.3430	-1.6980*** 0.4660	0.0196 0.1040
Independent variables			
Bank-specific variables			
i. Buffer capital in relative term	0.0007 (0.0006)	-0.0017 (0.0012)	-0.0011* (0.0006)
ii. Internal capital generation rate	0.0000* (0.0000)	0.0000 (0.0000)	-0.0000*** (0.0000)
iii. Financial intermediation	-0.0132 (0.0112)	0.0244* (0.0105)	-0.0019 (0.0027)
iv. Non-performing loan	0.0650 (0.0813)	-0.0311 (0.0737)	0.1170* (0.0664)
v. Implicit cost	0.0026* (0.0014)	-0.0067 (0.0088)	-0.0004 (0.0004)
vi. Income diversification	-0.00423 (0.0053)	-0.0033 (0.0331)	-0.0184 (0.0143)
vii. Management efficiency	0.1110 (0.0941)	-0.1100 (0.0918)	0.0131* (0.0052)
viii. Regulatory capital buffer	-0.0006** (0.0002)	-0.0009 (0.0006)	-0.0006*** (0.0001)
ix. Bank size	-0.0240 (0.0172)	0.1250*** (0.0247)	0.0014 (0.0026)
x. Tier 1 leverage	-0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
xi. Dummy variable (capd2015)	0.0094 (0.0147)	-0.1230 (0.0998)	-0.0102 (0.0123)
Industry-specific variables			
Herfindahl-Hirschman Index (HHI)	0.6260 (0.8060)	17.8900*** (3.6930)	0.5360 (0.4650)
Macroeconomic variables			
xiv. Term interest rate spread	0.0101 (0.0073)	0.118 (0.0824)	0.0099 (0.0089)
xv. Inflation rate	-0.0062* (0.0029)	-0.0318 (0.0224)	0.0025 (0.0029)
xvi. GDP growth rate	0.0204 (0.0138)	-0.256*** (0.0642)	-0.0123* (0.0068)
No. of observations	457	459	458
R- Square	0.2220	0.0585	0.2731
F- Statistics	73.47 (0.0000)	3590.60 (0.0000)	3144.60 (0.0000)

Note: The above table discloses the regression output from the fixed effect model of the determinants of ROA, ROE and NIM. Coefficients which are substantially different from zero at the 1%, 5% and 10% level are marked with ***, **, * respectively and Drisc/Kraay Standard errors in the parentheses.

Among bank-specific variables, we found significant positive relationship between buffer capital in relative terms and ROA negative with ROE and NIM. Internal capital generation rate is significantly negatively related with NIM but positive with ROA and ROE. This finding is consistent with the result of Shim (2010) and Goddard et al. (2004), but contradictory with the research outcomes of Berger (1995b) and Demirgüç-Kunt and Huizinga (2000). The coefficient of relative buffer capital is 0.000705 indicating that a 1% increase in buffer capital raises profitability by 0.07%. Internal capital generation rate (ICGR) is highly significant and negatively related with ROA and shows positive relationship with ROE. It indicates that more ICGR will influence in growing the asset base of the bank which in turn induces more profitability. This positive significant relationship establishes the fact that a higher capital requirement is justified to enhance internally generated profit, as opposed to the externally borrowed funds. ICGR is also a useful tool to maintain adequate level of buffer capital as suggested by the Basel III accord. It highlights the importance of capital in management planning for profit rates, growth rates and dividend policy (Gup and Kolary, 2005). Significant negative relation with NIM implies that maintaining regulatory requirement this variable reduce bank capacity to earn interest income. As a result profitability will be reduced.

Management efficiency is appeared to be significantly and positively related with ROA and NIM but negatively related with ROE, indicating that the higher efficiency of management will generate higher profit through proper utilization of asset and enhance higher interest margin. Negative relation with ROE indicates incompetent utilization of debt capital which instigates banks to charge lower intermediation cost. Regulatory buffer capital (RCB) has a highly significant negative relationship with ROA and NIM but positive with ROE. The regression outcome showed that 1%

increase in regulatory capital buffer decreases ROA by 0.06% and also NIM by 0.06%. It means, cost of additional capital requirement will lower the profitability of banks. García-Suaza et al. (2012) pointed out that restrictions of higher capital obligation are costly to banking institutions and the economy as a whole. Intensifying the ratio of regulatory capital implies a decrease in funds available for loans. Due to the reduction of the supply of loanable funds, economic activity may be compromised by creating financing and investment more expensive which will ultimately reduce the profitability of banks. It's worth noting because of the scarcity and the costs associated with acquiring equity.

The study noted that bank size has a significant and negative relationship with ROA which means that the higher assets of a bank lessen the profitability. This is because smaller banks are convenient to manage than larger one, specifying lower efficiency and higher administrative costs for larger banks. This result is in harmony with the research work done by Rahman et al. (2017); Zheng et al. (2017) and Tan and Floros (2013). Again, bank size is positively and significantly related with ROE which indicates that large banks enjoy the advantage of economies of scale and diversification which eventually contribute to attain greater profit (Dietrich and Wanzenried, 2011).

Tier I leverage is insignificantly positively related with ROE and NIM, indicating that the higher ratio of the bank could resist more to absorb a negative financial shock. This leverage ratio measures a bank's core capital relative to its total assets which was introduced by the Basel III accord in 2010. Financial intermediation, non-performing loan and implicit cost have significant positive association with ROE, NIM and ROA respectively.

The dummy variable *capd2015* is taken to test the effects of execution of Basel III accord. Since the Basel III accord was applied in Bangladesh in 2015, the dummy variable equals 1 in the current year and subsequent year and 0 before. The dummy variable is insignificantly and positively associated with ROA meaning that, Bangladeshi banks being well- capitalized and able to easily meet Basel Capital requirement. But negatively relation with ROE and NIM which can be interpreted as, the shareholders tend to reduce their level of investment when the capital buffer increases during the implementation of Basel III regulatory requirement.

Investigating the results of the Herfindahl-Hirschman Index (HHI), we observe that HHI has a strong significant relation with bank profitability proxied by ROE. The positive relationship with ROA and NIM support efficiency structure hypothesis (ES), which holds that profitability of the banks, would be positively related to their efficiency by using proper utilization of assets and by increasing interest spread, as posited by Molyneux and Forbes (1995). Again, negative and significant association with ROE implies that banks needed to reduce their market share to become profitable during the study period. It can be executed by identifying the banks which are unprofitable for abusing bank interest by the owners.

Among macroeconomic variables, we considered term interest spread of 10 years and 5 years of Government treasury bond and perceived affirmative impact on all the profitability indicators of banks in Bangladesh i.e. 1% increase in term interest spread will increase ROA, ROE and NIM by 1.01%, 11.8% and 0.99% respectively. The nexus between inflation the proxy variables of bank profitability measured by ROA and ROE is negative but positive with NIM. It can be expressed as 1% upsurge in inflation reduces ROA, ROE by 0.62%, 3.18% respectively. Due to upturn in inflation, it may boost up salaries and operating cost and therefore shrinkage bank profitability.

At the same time positive relationship between inflation and NIM indicates that banks may impose higher lending rate to cover higher financing cost in an inflationary world. As a result, spread will increase which in turn accelerate profitability of banks. We observed negative and significant coefficient of ROE and NIM with GDP growth, supporting the view that the profitability of banks is detrimental for economic growth. Result obtained from this study is in accordance with the research work performed in Sub-Saharan context by Francis (2013) pointing out that the banking sector capacity to manage loans losses and loans originate in GDP expansion period. But it positively and insignificantly influences on ROA, as similar with the study of Simiyu and Ngile (2015). It means, the financial development through increase in bank profitability will not influence on economic growth in Bangladesh.

4.6. Conclusion and policy implication of the study

We carried out an investigation of panel data set from 2007 to 2017 with bank specific, industry specific and macroeconomics variables and presented the empirical results of how these variables affect bank profitability in Bangladesh. Different determinants of the banks' profitability have been studied in the literature. This paper examined the cyclical and procyclical behavior of bank capital buffer and its impact on bank profitability. We provided some empirical evidence and focused on the behavior of the capital buffers as recommended by the Basel III accord. Risk coverage is enhanced by introducing capital conservation buffer. Our work departs from the existing literature on capital buffer to a considerable extent. We found procyclical behavior of buffer capital in relative term with ROA. Significant counter cyclical impact was observed between regulatory buffer capital and ROE as well as NIM. Internal capital generation rate has a strong significant impact on ROA and NIM considered as the profitability indicator in our study. Bank size has a significant

positive influence on ROE due to hold large market can generate more profit through monopolistic competition. Tier I leverage introduced by Basel III has positive association with ROE and NIM, meaning that bank should generate more core capital to absorb any financial shocks to remain the profitability as before. The regulatory dummy capd2015 has a positive impact on ROA which indicates that Basel III has improved bank profitability. This result is impulsive because, combined impacts of buffer capital and regulation significantly reduces the variation in return on equity and net interest margin.

Regarding policy implications, since the revised capital adequacy framework was developed by the Basel committee and established Basel III accord at the end of 2010 to reduce the counter cyclical effect in the banking sector, our research work provides worthwhile suggestions to mitigate procyclicality by calibrating capital adequacy framework in Bangladesh. Policies to generate conservation buffer capital, banks have to develop their analytical capabilities and predict business cycle at aggregate and sectorial levels consciously. By providing competitive advantage, Basel III regulations may work as a revolution for the banking sector. Concisely, supervisors as well as the banks have to renovate them through guidelines for the banking industry and reinforce their internal control system to cope-up with the suggestions of Basel III agreement.

The future researchers may avail the advantages of constrains of this study in different ways. The researchers may perform comparative study between private banks and state-owned banks, Islamic banks and conventional banks etc., studies might include additional explanatory variables like corporate governance, corporate social responsibility, corporate tax rate, and deposit insurance to accelerate the model. Structural equation modeling, mediation effect modeling can be used to construct

econometric model. Finally, the study presumes that the association between regulatory buffer capital and bank profitability in Bangladesh context constitutes an important contribution to the concurrent literature and will be noteworthy for the future potential researcher and legislator.

Appendix 3

In table 4.7 the degree of correlation among the variables considered in the regression analysis are reflected in the correlation matrix. Considering the data in our study the matrix represents a weak correlation among the variables which can be interpreted as nonexistence of multicollinearity.

Table 4.7: Pair wise correlation matrix of the variables used in the study to assess the effect of capital conservation buffer on bank profitability¹

Variables	ROA	ROE	NIM	Buffer capital in relative term	Internal capital generation rate	Financial Intermediation	Non-Performing Loan	Implicit Cost	Income diversification	Management Efficiency	Regulatory Capital Buffer	Bank Size	Tire 1 leverage	Dummy Variable	HHI	Term Interest rate spread	Inflation rate	GDP growth rate
ROA	1.000																	
ROE	0.766***	1.000																
NIM	-0.054	-0.056	1.000															
Buffer capital in relative term	0.043	0.046	-0.005	1.000														
Internal capital generation rate	0.766***	1.000***	-0.056	0.046	1.000													
Financial intermediation	0.014	0.006	-0.006	-0.012	0.006	1.000												
Non-performing loan	-0.134***	-0.159***	0.026	0.007	-0.271***	0.461***	1.000											
Implicit cost	0.030	0.015	0.003	-0.079*	0.014	0.016	-0.043	1.000										
Income diversification	0.028	0.018	-0.181***	0.009	0.017	-0.025	0.014	0.106**	1.000									
Management efficiency	-0.311***	-0.463***	0.110***	-0.086**	-0.464***	0.101**	0.237***	-0.005	-0.026	1.000								
Regulatory capital buffer	-0.026	0.004	-0.012	0.010	0.004	-0.002	0.082*	0.005	0.058	-0.020	1.000							
Bank size	-0.006	-0.099**	-0.026	0.044	-0.101**	0.075*	0.060	-0.135***	0.083**	0.189***	0.069*	1.000						
Tire 1 leverage	0.027	0.009	-0.004	-0.002	0.009	0.011	-0.022	0.024	0.048	0.000	-0.005	0.198***	1.000					
Dummy variable	-0.053	-0.033	0.048	0.033	-0.034	-0.045	-0.089**	-0.025	0.020	0.005	0.031	0.220***	0.038	1.000				
HHI	0.027	0.023	0.080*	-0.056	0.022	-0.014	-0.062	0.059	-0.064	-0.059	-0.038	0.226***	0.020	0.393***	1.000			
Term interest rate spread	0.062	0.065	-0.004	-0.112***	0.066	-0.030	0.021	0.134***	-0.020	0.010	-0.027	-0.046	0.008	0.064*	0.004	1.000		
Inflation rate	-0.023	-0.001	-0.017	-0.024	-0.001	-0.050	-0.066	0.032	0.008	0.004	0.001	0.136***	0.025	0.605***	0.303***	0.471***	1.000	
GDP growth rate	0.055	0.03	-0.067*	-0.036	0.032	0.030	0.095**	0.020	-0.052	-0.012	-0.025	-0.223***	-0.041	-0.799***	-0.378***	0.177***	-0.359***	1.000

*** p<0.01, ** p<0.05, * p<0.1

¹Stata output

² Refer to the table 4.3 of the summary statistics for clarifications of the variables name

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