What Determine the Profitability of Commercial Banks in Bangladesh? Evidence from Econometric Analysis

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Abstract

This study investigates the impact of bank-specific and macroeconomic factors on the profitability of commercial banks in Bangladesh, capturing the period from 2009 to 2018. The secondary balanced panel data are taken to analyse as a sample of 12 commercial banks for 120 observations. Profitability is measured by return on assets (ROA) which is affected by bank-specific (internal) factors such as bank size, capital adequacy, liquidity, deposit, operating efficiency and non-traditional activities that can be controlled by the bank management and macroeconomic factors (external) such as GDP growth rate and inflation rate. The study applies the random effect (RE) model, which the Hausman specification test has chosen. Further, the study applies the generalised methods of the moment (GMM) to control the effects of heterogeneity within and between panel groups. The empirical results from the random-effect model suggest that bank size, liquidity and GDP growth rate have had a negative and significant impact on bank profitability. The results also show that capital adequacy, deposit, operating efficiency and non-traditional activities are positively and significantly related to the profitability of commercial banks. The generalised methods of the moment (GMM) reports that bank profitability is positively and significantly

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affected by capital adequacy, deposit, operating efficiency, and non-traditional activities positively and significantly. In contrast, liquidity has had asignificant negative impact on the profitability of commercial banks in Bangladesh.

JEL Classification *G21 · E30 · C1*

Keywords *Return on Assets (ROA)· Internal and External Factors · Random Effect Model · Generalised Methods of Moments· Commercial Bank in Bangladesh.*

1. Introduction

The financial system of Bangladesh is dominated by the depository institutions that collect deposits from individuals and organisations and provides loans. Like other modern banks, deposit institutions collect and distribute money to different entities and provide many services to various entities that facilitate their business operations. According to Fama (1980), banks are such types of business wherein deposits are considered liabilities and issuing debt securities are considered assets.

An efficient financial system improves banks' profitability by increasing the amount of funds available for investment while enhancing the quality of services provided for the customers (Soana, 2011). Thus banks open up secure channels of savings and investment, which are most vital for promoting economic growth. Recently, the financial sector has become the main driving force and pillar for accelerating the economic growth of modern economics in Bangladesh. The banking system plays an essential financial intermediary role, and they are considered the backbone of economic growth. Almost all the economic activities are integrated with the functions of banks. However, the health of banking financial institutions is critical to the health of the general economy at large. The banking sector of developing countries is less stable than developed countries (Uddin and Suzuki, 2011).

Bangladesh has a hybrid banking system that comprises six state-owned commercial banks (SCBs), 40 commercial banks (PCBs), nine foreign commercial banks (FCBs) and two specialised banks (SBs). The Central Bank of Bangladesh, the Bangladesh Bank, formulates and implements monetary policies and regulates the country's banking sector. Although Bangladesh Bank has been taken some policies to stabilise the financial system and regulate the banking sector in Bangladesh, it is still relevant to know what factors affect the profitability of commercial banks to influence policymaking in the banking sector in Bangladesh. Given the relationship between the well-being of the banking sector and the growth of the economy (Rajan and Zingales, 1998), understanding

the essential factors that influence the financial sector's profitability is therefore crucial not only for the managers of the banks but also for numerous stakeholders such as the central banks, bankers' associations, governments, and other financial authorities. There are many factors of bank profitability as a measurement that would be useful in helping the regulatory authorities to formulate future policies aimed at determining the profitability in the banking sector of Bangladesh. In addition, different market and macroeconomic factors also influence the ability of the banks to make profits (Short, 1979; Molyneux and Thornton, 1992; Athanasoglou et al., 2008). Thus, bank-specific (internal) and macroeconomic variables (external). So, this study examines the internal factors like bank size, capital adequacy, liquidity, deposit, operating efficiency and non-traditional activities and the internal factors like GDP growth rate and an inflation rate that influence the determinants of profitability of commercial banks in Bangladesh.

2. Literature Review

Different studies in different countries around the world have been conducted to investigate the factors that influence banks' profitability. To understand the basic concepts and framework, some prior literature review is reported. Bhogale (2019) investigates factors of bank profitability of fourteen private commercial banks in Ethiopia over the period from 2008 to 2017 using unbalanced panel data. Fixed effect regression results reveal that capital adequacy and bank size significantly affect bank portability. In contrast, operation efficiency has a significant negative effect on profitability, but liquidity risk and credit risk are not essential variables determining bank profitability. Among macroeconomic variables, foreign exchange rate and lending interest rate have a significant negative effect on the profitability of Ethiopian private commercial banks. On the contrary, inflation and real GDP growth rate are statistically insignificant.

Berger and Bouwman (2013) empirically estimate the impact of capital on banks' performance during financial crises and normal times in the US over the past quarter-century. This study finds out two results affecting the bank performance: firstly, capital helps the small bank enhance their profitability of survival and market share at all times. Secondly, this study finds that capital increases the performance of medium and large in the period of banking crises.

Kassem and Sakr (2018) explore the dynamic relationship between bank-specific factors and banks' profitability in Egypt. OLS regression analysis is employed to investigate the relationship between internal factors and profitability for a sample of 19 Egyptian commercial banks over the period 2007-2016. Results show that bank size and loan loss provision has a positive and significant

relationship with all measure of profitability. On the other hand, the capital ratio indicates a significant relationship with ROA and NIM, insignificant with ROE. Finally, the evidence also shows that the other two internal factors, loan and deposit ratios, have no significant impact on profitability.

Kiganda (2014) attempts to provide the effect of macroeconomic factors on bank profitability of commercial banks operating in Kenya with equity bank limited in focus respectively using annual data for five years spanning from 2008 to 2012. Using the ordinary least square method (OLS), this study suggests that macroeconomic variables negatively affect bank profitability at a 5% level of significance. However, bank-specific variables related to this study have a positive and significant effect on bank profitability in Kenya.

Adeusi et al. (2014) examine the factor affecting the profitability of commercial banks' profitability in the Nigerian banking industry using panel regression analysis for 14 commercial banks spanning from 2000 to 2013. The results of fixed and random effects estimations indicate that asset quality, management efficiency, and economic growth are statistically significant on profitability. Results also show that asset quality is more significant on profitability in all models, and credit risk is a significant determinant of commercial banks' profitability.

Acaravci and Calim (2013) assess the relationship between the bank-specific and macroeconomic factors and the profitability of commercial banks in the Turkish banking sector over the period from 1998 to 2011. Results reveal that macroeconomic variables bear a less significant impact compared to bank-specific variables. However, the actual domestic product and real exchange rate are positive and statistically significant on profitability.

Islam et al. (2017) investigate the determinants of profitability employing annual data for all the second-generation 22 private commercial banks of Bangladesh for 2014-2015. The study applies multiple regression analyses to examine the significant determinants of profitability and to test the hypothesis. The author shows that asset size and net interest margin (NIM) have no significant effect on profitability, but non-performing loans to total loans have the most significant impact on banks' profitability. Moreover, investment activities have a positive impact on return on equity (ROE). Results suggest that diversified banking activities, including commercial banks' investment activities, help achieve more profitability.

Alper and Anber (2011) point out the bank-specific and macroeconomic determinants of the bank profitability in Turkey covering the period from 2002 to 2010. The study includes ten commercial banks as a sample size consisting of 90

observations. Results from empirical analysis indicate that asset size and non-interest income positively and significantly impact bank profitability. Conversely, the size of credit portfolio and loans under follow-up negatively impact banks profitability. Among the macroeconomic variables, only real interest rate positively relates to the performance of banks profitability.

Sayllgan and Yildrim (2009) assess the impact of determinants of return on assets (ROA) and return on equity (ROE) for a sample of Turkish banks during the period from 2002 to 2007 using monthly data. Using the multi-variable single equation regression method, results of the empirical study show that the banking sector's profitability seems to have increased along with declining inflation rate, consistently increasing industrial production index and improving budget balance. The results also show that profitability is positively related to capital adequacy in broad terms and negatively by growing off-balance sheet assets.

Bourke (1989) evaluates the concentration and other determinants of bank profitability in twelve countries in Europe, North America, and Australia. Data to estimate the determinants of profitability is based on the financial statements of 90 banks in the ten years from 1972 to 1981. In this research, the term' value added' is introduced to remove the difficulties in comparing banks in different countries. However, results agree with concentration and bank profitability studies for the domestic U.S. market and support is found for the Edwards-Heggestad-Mingo hypothesis. No support is found for expense preference expenditure theories.

Sufian and Habibulla (2009) examine the performance of 37 commercial banks of Bangladesh during 1997 and 2004. The experimental outcomes from regression analysis have shown that bank-specific characteristics, in particular loans intensity, credit risk, and cost, have positive and significant impacts on bank performance, but non-interest income exhibits negative impacts on bank profitability. Moreover, results have also shown that the size of the bank has a negative impact on return on average equity (ROAE) and a positive impact on return on average assets (ROAA) and net interest margins (NIM). The study includes some macroeconomic variables that have no significant impact on bank profitability, but inflation negatively impacts banks profitability.

Athanasoglou et al. (2008) seek to investigate the effect of bank-specific, industry-specific and macroeconomic factors incorporating the traditional structure- conduct-performance (SCP) hypothesis. A panel data set taken from Greek banks between 1985 and 2001 is evaluated using a generalised moments (GMM) technique. Findings suggest that factor influencing profitability in Greek banks is persisting to a moderate extent which explains that deviations from perfectly competitive market structures may not besignificant. They also reveal

that all bank-specific variables significantly impact bank size, while the business cycle is positively related to Greek bank profitability.

Molyneux and Thorton (1992) state a relationship between determinants of bank profitability and profit influencing indicators using panel data on a set of countries. The study considers a sample of 18 European countries from 1986-1989. The empirical research results exhibit a significant positive relationship between the return on equity (ROE) and the level of interest rates in each country, bank concentration, and government ownership.

Ramadan et al. (2011) explore the characteristics of internal and external factors that influence the profitability of Jordanian banks concerning a balanced panel data set. Results reveal that the relationship between macroeconomic determinants, inflation and economic growth and bank performance hasan insignificant positive impact on return on assets (ROA), but some of the differential slope coefficients are statistically significant.

Petria et al. (2015) estimate the bank-specific, industry-specific, and macroeconomic factors of the bank's profitability in EU27 from 2004 to 2011. Findings reveal that management efficiency, Credit and liquidity risk, the diversification of business, the market concentration/competition, and the economic growth affect the bank profitability on ROAA and ROAE while competition positively impacts bank profitability.

The earlier literature bears some weaknesses that need to be considered to conduct our research to clarify the concepts and econometric methods. From the survey of the existing researches, it is observed that there are much relevant profitability influencing factors that are absent in their research work. So, this study attempts to fill this gap considering the appropriate variables and factors.

3.   Data, Variables and Empirical Econometric Methods

3.1   Data

To analyse the determinants of profitability, secondary panel data are collected from annual reports of commercial banks in Bangladesh for ten years from 2009 to 2018. The study involves 12 commercial banks of Bangladesh due to the unavailability of data from other banks. However, our sample consists of balanced data set accomplishing 120 total observations. Data of macroeconomic variables are retrieved from World Data Indicators.

3.2   Variables

To evaluate the determinants of profitability, eleven variables are included. Among these variables, return on assets (ROA) is used as a dependent variable,

and the rest of the variables are used as explanatory variables. The explanatory variables are categorised into internal and external variables.

Dependent Variables: This study investigates the profitability of commercial banks in Bangladesh using a measure of profitability which are proxied as return on assets (ROA). Return on assets (ROA) is defined as the net profit after tax to total assets. Naceur and Goaied (2008), Kosmidou (2008), and Flamini et al. (2009) use the return on assets as a dependent variable in their research. It shows the profit per taka of assets and signals how effectively the bank's assets are being managed by an authority to generate revenues. The ROA is utilised to evaluate the competence and operational performance of the bank as it examines the profits generated from the assets invested by the bank (Jahan, 2012 and Golin, 2001).

Independent Variables: Several empirical evidence reveals that financial institutions' profitability, specifical banks, are affected by internal and external factors. The internal determinants include bank-specific variables, and the external factors reflect macroeconomic variables that are expected to affect banks' profitability.

Bank-Specific Variables: The internal factors are also known as bank-specific factors that are related to internal efficiency and managerial decisions. Some internal factors are selected in this study based on previous literature.

Bank Size: The bank size is measured as the natural logarithms of total assets (Size). It is the essential determinants of profitability of commercial banks. According to Flamini et al. (2009), the bigger the size of the banks, the lesser the requirement for profits, whereby lower interest rates are charged to borrowers. Rahman et al. (2015) and Alper and Anbar (2011) have found a significant positive impact on profitability. Conversely, bank size has a significant negative impact on profitability (Syafri, 2012).

Capital Adequacy: Capital adequacy is defined as the ratio of shareholder's equity to total assets. The factor discusses the ability of a bank to withstand the unanticipated losses in this study. This ratio investigates the linkage with the financial soundness of the bank between profitability and bank capitalisation. It is expected that the banks associated with well-capitalised have high profitability (Demirguc-Kunt and Huizinga, 1999; Berger, 1995 and Bourke, 1989). In other words, a high capital asset ratio is assumed to be an indicator of low leverage and, therefore, lower risk. Conversely, banks with lower capital adequacy are considered riskier relative to highly capitalised banks.

Liquidity: Liquidity is the ratio of total loans divided by the total deposit of banks. According to (Ongore and Kusa, 2014), liquidity is the bank's ability to meet its obligations, mainly those of depositors of funds. It is the ability of a firm,

company, or even an individual to pay its debts without suffering catastrophic losses. Investors, managers, and creditors use liquidity measurement ratios when deciding the level of risk within an organisation. If an individual investor, business, or financial institution cannot meet its short-term debt obligations, it is experiencing liquidity. Studies of (Molyneux and Thorton, 1992 and Guru, 2002) state that profitability and liquidity have had a significant negative relationship.

Deposit: The deposit of a bank is measured by deposit divided by total assets. Deposit is the liability for a bank that is the primary source of collecting funds for banks. Generally, any bank of a country can raise the loan scope to customers by raising banks' deposits. As a result, the rising loan can create more profit in future. In addition, there is a positive linkage between deposit and profitability (Lee and Hsich, 2013). More deposits of a bank can generate more profits, and lower deposits can generate lower profits.

Operating Efficiency: Operating efficiency is computed as the ratio of total operating cost to total operating income of banks. It indicates the management's ability to control costs. If the efficiency ratio increases, a bank's expenses are increasing, or its revenues are decreasing. Banks that focus more on cost control will naturally have a higher efficiency ratio, but they may also have lower profit margins. Some literature review indicates that low operating costs lead to greater profitability of commercial banks. Heffernan and Fu (2008) take the cost to income ratio as the operational efficiency ratio and show a negative relationship with profitability.

Non-Traditional Activities: Off-balance sheet activities to total assets is considered non-traditional activities (OFBSTA). It is also another critical determinant of bank profitability. Off-balance sheet activities may improve earnings ratios because earnings generated from the activities are included in the income numerator, while the balance of total assets included in the denominator remains unchanged. So this ratio is included in the regression equation that measures profitability to capture off-balance activities. Finally, off-balance-sheet activities help increase their income source without changing capital structure (Deelchand and Padgett, 2009).

Macroeconomic Variables

Like bank-specific factors, macroeconomic factors also affect bank profitability, which this study chooses based on a previous literature review. Several researchers have used GDP as a macroeconomic factor and a standard measure to measure the aggregate economic activity within an economy (Francis, 2013; Pasiouras and Kosmidou, 2007). The study conducted by Anbar and Alper (2011) has used the inflation rate.

GDP Growth Rate: The growth rate of gross domestic product (GDPG) is used to measure the macroeconomic conditions calculated as the annual change of the GDP. It measures the growth rate of the economy. It is the most commonly used macroeconomic indicator in the literature of bank profitability of commercial banks. A significant positive relationship is expected between the profitability of the banks and this variable based on the findings of Durajet al. (2015). According to the literature on the association between economic growth and financial sector profitability, GDP growth positively affects bank profitability (Demirguc-Kunt and Huizinga, 1999).

Inflation Rate: The inflation rate is used in this model to proxy the impact of inflation on profitability. Earlier literature shows that the impact of inflation on profitability depends on whether the inflation is anticipated or unanticipated. If inflation is fully anticipated, the interest rates are adjusted accordingly, resulting in increased revenues of banks and a positive impact on profitability. However, if inflation is unanticipated, the banks may be slow in adjusting their interest rates, resulting in a faster increase of banks costs that negatively impact bank profitability and vice-versa. The study conducted by Molyneux and Thornton (1992) and Bourke (1989) shows a positive relationship between inflation and bank profitability. Table 1 lists the measurements of different variables, notations and their Expected sign.

Table 1: Measurement of the Variables and their Expected Sign

Types	Variables	Measurement	Notation	Expected sign
Dependent variables	Return on assets	Net profit after tax/total assets	ROA	NA
Internal variables	Bank size	Natural logarithm of total assets	SIZE	+/-
	Capital adequacy	Equity/ total assets	CAD	+
	Deposit	Deposits/total assets	DP	+
	Liquidity	Total loans/Deposit	LQD	+/-
	Operating efficiency	Operating cost/operating income	OEF	+/-
	Non-traditional activities	Total of off-balance-sheet activities/total assets	OFBSTA	+
External Variables	Economic activity	GDP growth rate	GDPG	+
	Inflation rate	Annual inflation rate	INF	+/-

3.4   Empirical Econometric Methods

The purpose of this study is to estimate the determinants of profitability of commercial banks in Bangladesh. We applied the methodologies are fixed effects (FE) or random effects (RE) methods and generalised methods of moments (GMM). In order to choose the suitable econometric model (i.e., either fixed effect or random effect),the Hausman specification test is carried out. It means that the Hausman test decides which model is more appropriate. The generalised method of moments (GMM) is used by Berger et al. (2000), Goddard et al. (2004) and Athanasoglou et al. (2008).

The basic framework for the panel data is defined as per the following regression model (Brooks, 2014). The model consists of i cross-sectional units in the panel data, denoted by i= 1,,N, observed at each of t time periods, t = 1,.....,T. In data set, the total observations are i × t.

$$Y_t = \alpha + \beta X_t + \varepsilon_t \tag{1}$$

Where Yit denotes the profitability indicator, α is referred to as intercept term, β is a k × 1 vector of the parameter to be estimated, and vector of observations is Xit, (t = 1, …, T, i= 1, …, N) and ε_itdenotes the error term.

In this study, the functional form of variables is specified as:

Profitability = f (Bank-specific variables, Macroeconomic variables)   (2)

Where ROA measures profitability, the bank-specific variables are bank size, capital adequacy, liquidity, deposit, operating efficiency and non-traditional activities and macroeconomic variables include GDP growth rate and inflation rate.

Panel data models are estimated using either fixed-effects or random-effects models. Fixed effect models describe that the individual-specific effect is a random variable that can be correlated with the explanatory variables. The rationale behind the random effect model is that, unlike the fixed effects model, the individual-specific effect is a random effect variable uncorrelated with the independent variables. Further, the Hausman test is conducted to decide the appropriate model between fixed and random effect models.

In panel data analysis, fixed effect or random effect models are usually applied. However, it is argued that the persistence of bank profitability over time can affect next year's profit (Athanasoglou et al., 2008). As a result, a difficulty arises with these models when a lagged dependent variable is concerned,

particularly in very few periods and many observations. To mention this issue, Arellano and Bond (1991) develop the difference of generalised method of moments (GMM) model by differencing all repressors. It is a single left-hand-side variable that is dynamic depending on its own past realisations.

Arellano and Bovern (1995) and Blundell and Bond (1998) argue that the GMM difference estimator is inefficient if the instruments are weak. Hence, they developed a new method called GMM system estimator and includes lagged levels and lagged differences. The system GMM estimator assumes that the first differences of instrumental variables are uncorrelated with the fixed effects. It also argues that both difference and system GMM estimators are suitable for situations with "small T, large N" panels. The specification for GMM proposed by Athanasoglou et al. (2008) is used to conduct the empirical analysis:

$$Y_{it} = C + \delta Y_{i,t-1} + \sum_{j=1}^{j} \beta_j X_{it}^j + \sum_{m=1}^{m} \beta_m X_{it}^m + \varepsilon_{it} \qquad (3)$$

Where,

$$\sum_{j=1}^{j} \beta_j X_{it}^j = \beta_1 SIZE_{it} + \beta_2 CAD_{it} + \beta_3 LQD_{it} + \beta_4 DP_{it} + \beta_5 OEF_{it} + \beta_6 OFBSTA_{it} \ (4)$$

$$\sum_{m=1}^{m} \beta_m X_{it}^m = \beta_1 GDPG_{it} + \beta_2 INF_{it} \qquad (5)$$

Where, Y_it is the probability indicator proxied by ROA of bank i at time t, where i = 1,…,N, t = 1,….,T. C is the constant term. Yi,t-1 denotes the one-period lagged value of the dependent variable, the speed of adjustment to equilibrium. A value between 0 and 1 implies that profit persists, but eventually returns to its normal level. A δ value close to 0 means that the industry is pretty competitive (high speed of adjustment), while a value δ close to 1 implies a less competitive structure (very low adjustment). Xit is the explanatory variables and εit the disturbance term, i.e. εit= vit+ uit, with vit the unobserved bank-specific effect and uitth idiosyncratic error. It is a one-way component regression model, where vit ~IIN (0, σv2) and independent of uit ~ (0, σu2). The Xit is grouped into bank-specific Xjit and macroeconomic variable Xmit. Bank-specific variables are bank size, capital adequacy, liquidity, deposit, operating efficiency and non-traditional activities. On the other hand, macroeconomic variables considered are GDP growth rate and inflation rate.

4.   Results and Discussions

This section provides descriptive statistics of variables, the correlation matrix of explanatory variables, random effect regression results and GMM regression results.

4.1   Descriptive Statistics of Variables

This section presents the descriptive statistics for the dependent and independent variables in the regression model mentioned in the methodology. The basic descriptive statistics of all variables utilised are presented in Table 2. Table 2 shows the total observation, mean, standard deviation, maximum and minimum value for each variable.

Table 2: Descriptive Statistics of Variables

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
ROA	120	0.009	0.013	-0.073	0.042
SIZE	120	25.999	0.664	24.534	27.487
CAD	120	0.07	0.037	-0.134	0.147
LQD	120	0.906	0.539	0.538	6.612
DP	120	0.797	0.057	0.624	.91
OEF	120	0.627	1.56	0.235	17.444
OFBSTA	120	0.304	0.133	0.013	.597
GDPG	120	5.255	1.274	2.416	7.864
INF	120	6.259	2.301	2.007	11.395

From Table 2, the mean value of profitability measure like return on assets (ROA) is 0.009. The maximum value for ROA is 0.042, whereas the minimum value is -0.073. The standard deviation of ROA is 0.013.In the case of profitability influencing internal factors, bank size is the factor of profitability, the natural logarithm of total assets. The mean value of bank size is 25.99and the standard deviation of 0.664, which implies that the maximum and minimum values are 27.487 and 24.534, respectively. The mean value of capital adequacy (CAD) is 0.07, whereas the maximum value is 0.147, with a negative minimumof -0.134. The standard deviation for CAD is shown by 0.037. Liquidity (LQD) is the critical factor of profitability, implying that the average value is 0.906 and the standard deviation of 0.539. The maximum and minimum values of liquidity are indicated by 6.612 and 0.538. The mean deposit (DP) value is 0.797, whereas the maximum value is 0.91 and the minimum value is 0.624. The average value of

operating efficiency represented by OEF is 0.627 with a standard deviation of 1.56, whereas the maximum and minimum values of OEF are 17.44 and 0.235, respectively. The off-balance sheet activities to total assets (OFBSTA) have a mean value of 0.304 and a standard deviation of 0.133 with a maximum value of 0.597 and a minimum value of 0.013.In the case of profitability influencing external factors, the average values of GDP growth rate represented by GDPG and inflation represented by INF are 5.255 and 6.259, respectively. Finally, the maximum value of GDPG is 7.864 with a minimum value of 2.416, and the maximum inflation is indicated by 11.395 with a minimum value of 2.007.

4.2   Correlations Analysis of Explanatory Variables

Table 3 presents the correlation coefficient between the explanatory variables used in the regression models. The overall eight explanatory variables are used in this study which is bank size, capital adequacy (CAD), liquidity (LQD), deposit (DP), operating efficiency (OEF), non-traditional activities (OFBSTA), GDP growth rate (GDPG) and inflation (INF). There is no multicollinearity problem in this correlation matrix because of the low degree of the correlation coefficient between explanatory variables. In Table 3, the correlation between explanatory variables is shown:

Table 3: Correlation Matrix of Explanatory Variables

Variables	SIZE	CAD	LQD	DP	OEF	OFBST	GDPG	INF
SIZE	1.000							
CAD	-0.167	1.000						
LQD	0.014	-0.088	1.000					
DP	-0.149	-0.157	-0.126	1.000				
OEF	0.026	-0.569	-0.011	-0.070	1.000			
OFBSTA	-0.183	0.568	0.056	-0.307	-0.215	1.000		
GDPG	-0.225	-0.065	0.075	0.128	0.065	-0.020	1.000	
INF	-0.150	0.011	-0.008	0.160	0.048	0.011	0.164	1.00

Table 3 shows that the highest correlation coefficient is between off-balance sheet activities (OFBSTA) and capital adequacy (CAD), with a magnitude of 0.568. The correlation matrix implies no multicollinearity problem among the explanatory variables, and hence the study results are efficient. According to Gujrati (2002), the multicollinearity problem can be considered if the pair-wise correlation coefficient between two regressions is more than 0.8. Finally, since all independent variables have a correlation coefficient with a lower value than 0.8, there is no multicollinearity phenomenon.

4.3　Hausman Specification Test

Many studies have used the fixed-effect method (FEM) and random effect method (REM) to estimate the determinants of profitability of commercial banks. However, both methods are not appropriate to estimate the result of the study. To determine which model is more appropriate, we can run the Hausman test developed by Hausman (1978). Table 4 depicts the Hausman test results that fit the model:

Table 4: Hausman Specification Test

Hausman test	Prob>chi2
ROA	0.510

Table 4 shows that for three different dependent variables, there are three models, and they display the P-values by Hausman test, which suggests that if the null hypothesis is accepted at a 5% significant level that indicated by P-value, then the fixed-effect method may be more appropriate to be used compared to the random effect method. However, if the alternative hypothesis is rejected at more than 5% significance levels, the random effect model is more suitable. Since the p-value for the three models is 0.510, 0.348 and 0.331, which are excess of 5% levels of significance in this study, the random effects model is an efficient estimator of the data compared to the fixed effect model. Hence, the study adopts the random-effects model.

4.4　Random Effect Regression Results and Discussions

This section presents the random effect regression analysis results on the determinant factors of commercial banks profitability in Bangladesh. From the

Table 5: Relationships between Explanatory Variables and ROA

Variables	Coefficient	t-value	p-va
SIZE	-0.005***	-3.87	0.00
CAD	0.236***	8.05	0.00
LQD	-0.007***	-5.27	0.00
DP	0.056***	3.96	0.00
OEF	0.002***	3.00	0.00
OFBSTA	0.016**	2.23	0.02
GDPG	-0.001**	-2.17	0.03
INF	0.000	-0.97	0.334
CONSTANT	0.074**	2.06	0.03
Model Summary			
Overall R^2	0.680	Number of obs	120.
R^2 within	0.583	Wald χ^2	235.
R^2 between	0.886	Prob>χ^2	0.00

Note: ***, ** and * indicate the significance at 1%, 5% and 10% levels respectively.

Hausman specification tests carried out, the Random effect model has been pointed as the most efficient model to be applied by the study. The Random effect method is run to determine the determinants that affect the profitability measurement of ROA. The factors determinants are identified by bank size (SIZE), capital adequacy (CAD), liquidity (LQD), deposit (DP), operating efficiency (OEF) and non-traditional activities (OFBSTA). The regression results using this method are presented as follows.

As shown in Table 5, the overall R2 of 0.683 indicates that the included explanatory variables explain about 68.3 % variation in dependent in the banking sector and the remaining 31.7 % variation is due to unobserved variables or error terms. The Wald $\chi^{\wedge}(2)$ statistic of 235.718 shows that the model is correctly specified and that the null hypothesis of variable inclusion is rejected at the 1% level of significance.

Table 5 shows that the coefficient value of bank size and liquidity is a negative and statistically highly significant determinant of profitability for the ROA model at a 1% significance level. This negative result of bank size is consistent with the finding of Athanasoglou et al. (2005). Molyneux and Thorton (1992) and Pasiouras and Kosmidou (2007) find a significant and negative relationship between liquidity and profitability. There is a positive and highly significant relationship between capital adequacy, deposit and operating efficiency and profitability measurement of ROA at a 1% significance level. This positive empirical result of capital adequacy is consistent with Pasiouras and Kosmidou (2007) studies and Demirguc-kunt and Huizinga (1999). The non-traditional activities are regarded as off-balance sheet activities to total assets, with a positive coefficient of 0.016 and statistically significant at the 5% level of significance.

4.4   GMM Regression Results and Discussions

Return on assets has been considered to determine the profitability factors of commercial banks in Bangladesh using generalised system methods of the moment (GMM), which are described as follows. To verify the result from the random effect model and control effects of heterogeneity within and between panel groups, this study also conducts the generalised methods of the moment (GMM). The system GMM tries to deal with weak instrument problem by augmenting instruments. Furthermore, over-identification is tested using Sargan's test.

From Table 6, the model seems to fit the panel data reasonably well, having pretty stable coefficients, while the Wald $\chi^{\wedge}2$ is 206.731 at 1% significance level, indicating goodness of fit, and the Sargan-test value (84.05847) shows that there is no evidence of over-identifying restrictions.

Table 6 shows that capital adequacy (CAD), operating efficiency (OEF) and non-traditional activities have a positive and highly significant impact on the profitability of commercial banks in Bangladesh at a 1% level of significance. The finding of the positive coefficient is consistent with previous studies of Masood and Ashraf (2012), indicating that banks with sound capital positions located in Bangladesh face lower costs, which also suggests reduced cost of funding or lower need for external funding, implying higher profitability. There is a positive and significant relationship between deposit and bank profitability at a 5% significance level. The deposit of commercial banks is the main sources of funding. The deposits are transformed into loans and it raises the bank profitability. The coefficient of 0.064 indicates that 1% increases in deposit increase the 6.4% return on assets. It means that an increase in deposit leads to an increase in profitability measure of ROA. Referring to the impact of liquidity, negative and highly significant impact on the profitability of commercial banks is found 1% significant level. The negative coefficient implies that an increase (decrease) in liquidity reduces (increases) the profits of commercial banks.

5.   Conclusions

The banking sector contributes to economic growth in general, and primarily commercial banks of Bangladesh are regarded as the essential sources of funding. This study aims to determine the factors that influence the profitability of commercial banks in Bangladesh and to estimate the significant factors using panel data from 12 commercial banks in Bangladesh and applying econometric panel methods, random-effects model and generalised methods of moments. Moreover, this study focuses on the bank-specific and macroeconomic factors that act as determinants of profitability. Random effect regression results report that bank size, liquidity, and GDP growth rate negatively impact profitability. Capital adequacy, deposit, operating efficiency and non-traditional activities are positively and significantly related to profitability. Generalised methods of moments suggest a positive and significant relationship between capital adequacy, deposit, non-traditional activities and bank profitability measurement of ROA. Liquidity has a significant negative effect on profitability. The policy implication from the findings of this study suggests that bank size, capital adequacy, deposit, liquidity and non-traditional activities are critical factors for ensuring sustainable operations of commercial banks and contributing to the national economy as a whole. It recommends that a large bank size may not necessarily be able to earn higher profits. Instead, small size banks and their efficient utilisation may lead to higher profit. This study further shows that well-capitalised banks ensure financial

stability and make the industry more resilient against external shocks and risk. So, the management should concentrate on ensuring better capital management to increase the profits of banks. This finding indicates that those banks holding higher liquid assets are likely to have reduced profitability. It is also recommended that management concentrate on increasing their deposit for higher profitability and sustainability in the long run. The more deposits are transferred into the loan, the more profitability of commercial banks in Bangladesh.

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