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Impact of Capital Adequacy on Profitability Under Basel II Accord: Evidence from Commercial Banks of Bangladesh

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Abstract
This paper explores the effect of several bank specific variables including capital adequacy on the profitability of listed commercial banks operating in Bangladesh. Determinants of banks' profitability like ROA and ROE have been assessed by the panel data (232 observations) of 29 listed banks out of 30, for the time period of eight years (2007-2014). These sample banks cover approximately 62% of total banking sector asset in the year 2014 in Bangladesh. In this study, profitability has been quantified in terms of regulatory capital, operating efficiency, bank's asset size, loan structure and leverage. This study found that the regulatory capital held by banks is greater than the minimum capital requirement guided under Basel II accord. Again, it has been showed that explanatory variables like capital adequacy, operating efficiency and loan structure are positively related to profitability of a bank.
Keywords: Basel II, bank profitability dimension, Bangladesh.

1. Introduction

Capital adequacy is the measurement of minimum level of capital which is required to guard a bank from losses of the portfolio. However, there exists a debate on the minimum level of capital that a bank should hold (Kabir, 2005). The latest financial crisis proves the fact that the global banking industry is becoming very risky. Main reasons of such leveraged banking include deregulation in international financial, innovation in the product and technology and above all the financial market integration (Sahajwala and Van den Bergh, 2000). Such changes have led the elevation of the methodologies and techniques of the banks to assess and administer their level of risk (Carauana, 2004). The Basel accord thus has been materialized as a way to ensure stability in the financial system and has developed a structure through using a bundle of rules and regulations which are considered eligible by global financial hubs and also consent a scientific view of risks. According to the Basel accord, banks need to hold a minimum level of capital based on its financial condition. These types of capital regulation are friendly to economy as these bolster banks' scenario against losses generating from different exposures like credit, operation, market etc. (BIS, 2004; Hasan, 2008).

Following the downfall of Bankhaus Herstatt in Germany and Franklin National Bank in the United States in 1974, central bankers of G-10 countries formed the Basel Committee on Banking Supervision (BCBS) under the patronization of Bank for International Settlements (BIS, 2008; Engelen, 2005). First accord of Basel was introduced in 1988 with the purpose of safeguarding the global banking system from the attack of financial crises. This accord was warmly accepted and thus established the principle of minimum capital requirement (Makwieamiti, 2008). The main focus of the accord was ensuring the security of the bank from credit risk. The Basel I accord was replaced by Basel II accord which not only restructures the minimum capital requirement of banks, but adds two new pillars like supervisory and market discipline; in order to strengthen the new accord. As the Basel II was declared in the session of global financial crisis, its life span became very short and was substituted by Basel III in 2010.

In Bangladesh, the Bangladesh Bank circulated the guidelines of Basel I in 1996 with the regulation of maintenance of minimum capital adequacy at the rate of 8% of risk weighted assets and switched to Base II in the session of 2009-2010 with the regulation of holding capital adequacy at the rate of 10% of the risk weighted assets (Ahmed and Pandit, 2012).

1.1 Objective of the Study

The main objective of this research is an endeavor to highlight the effect of Basel II accord in the banking sector of Bangladesh through the investigation of profitability determinants measured by capital adequacy ratio, operating efficiency ratio, natural logarithm of total bank assets, total loans to total asset and debt to total asset ratio.

1.2 Scope of the Study

Though banks of Bangladesh started following the regulations under Basel III accord from 2015, this study does not include the implication of the latest accord as it is still in the implementation period. In addition, this study is grounded on only the listed commercial banks with Dhaka Stock Exchange (29 out of 30) in Bangladesh.

2. Literature Review

Numerous studies have been conducted on the effect and implication of Basel accord on conventional banks of different countries along with influence of these banks on behavioral finance. In different studies by Keeley (1990); Furlong (1992); Haubrich (1993); Bernake (1995); Peristiani (1996); Blum (1999) etc. have highlighted Basel accord and its effect of enforcement on banks all over the world. They identified that banks failure to comply the accord seem this regulation tougher for them. But, it is helpful for banks to increase the safety through holding minimum capital and face the probable financial crisis with more diligence. Again, they found negative trend in credit facility as many a bank focuses on holding of capital. Thus, volume of credit becomes limited. Benmanke and Gertler (1995) summarized that stringent capital requirement regulation is adversely affecting the performance of banks and leading to banks into barriers in case of collecting new fund when it is needed. Higher capital requirements have lessened the inducement of a value maximizing bank to intensify its asset risk (Furlong, 1989; Keeley, 1990).

In the context of Malaysian Islamic banks Ismail (2003) summarized that bank can transform its financial structure according to shape of securities and retain minimum capital requirement through following Basel II. He further concluded that through the obligation of these regulations, banks can minimize the level of risk weighted assets. It may lead to enhance capital adequacy ratio by converting assets into 20% risk category from other risk categories, which may require higher volume of capital.

Kim and Moreno (1994) argued similar result like Ismail (2003) on conducting studies on Japanese commercial banks that regulations imposed on Japanese banks on minimum capital requirement led to turn off credit position and increased the level of carefulness in case of sanctioning new loans. Each banks in Japan started exercising more stringent conditions on loan approval that ultimately decreased the total volume of loan in the domestic market (Honda, 2000). While, banks facing lower capital adequacy reduced the lending facility to very concentrated customers (Ito and Sasaki, 1998).

Montgomery (2005) showed that overall financial portfolio in the Japanese banks shifted to moderate or low level risk category through the implication of Basel regulation of holding minimum capital adequacy ratio. Again, the regulation of capital adequacy requirement has enhanced the cost level of loans. Enhancement in the marginal cost of debt has reduced the loan growth and thus stability in the economy has been slowed down (Angelini, 2011). Kashyap, Stein and Hanson (2010) reported in their studies that enhancement in equity to assets ratio may lead to the increase of spreads due to implication of Basel II accord in banks.

2.1 Affiliation between Capital and Profitability

Profitability of a bank is influenced by higher capital requirement and thus hovering concern on the relationship between financial performance (profitability) and minimum capital requirement of bank (Christian et al., 2008). Aggarwal and Jacques (1998) summarized blurry (often positive and negative) results on the relationship between capital and profitability of bank. In different studies, empirical evidence shows that higher capital requirement can be a reason of higher profitability. Such as, (i) Insurance expenses of well capitalized banks on various uninsured debt become lower (Lee and Hsieh, 2013; Shim, 2010); (ii) Projected bankruptcy cost of sound capitalized firms becomes lower as a result, their cost of funding decreases that ultimately enhances the level of profitability (Berger, 1995) and (iii) Dissimilar level of capitalization may reveal different level of asset risk (Iannotta et al., 2007).

Numerous other reports on Basel accord also concluded positive relationship between regulation on capital requirement and level of profitability (Pettway, 1976; Demirgüc-Kunt and Huizinga, 2000; Goddard et al., 2004). Again, analyzing Eastern European banks, Caprau and Ihnatov (2014) showed that profitability of a bank is positively related with the capital adequacy ratio (higher CAR incurs higher profitability). Likewise, other numerous studies exposed positive relationship between profitability of banks and equity to asset ratio (Abreu and Mendes, 2001; Staikouras and Wood, 2003). Contemporary banking theories also promulgate positive correlation between bank capital and its market share as banks with higher capital can easily attract more depositors and disburse more loans with favorable conditions (Berger, 2013; Allen et al., 2011; Mehran and Thakor, 2011; Calomiris and Powell, 2001).

However, in different studies, many a scholar has identified negative relationship between capital requirement and risk on profitability (Jahankhani and Lynge, 1980; Brewer and Lee, 1986; Karels et al., 1989; Jacques and Nigro, 1997; Blum, 1999; Agusman et al. 2008). For instance, Blum (1999) found that due to reduction in profit as a result of holding higher capital, banks may focus on assets of higher risk in order to increase the profit level. Similarly, Regulation of capital requirement affects both performance of a bank and credit creation mechanism in the economy that ultimately lessens the profit of the bank (Berger, 1995).

Numerous studies have been conducted on effects and implications of Basel accord on banks in the United States and Europe and very little on banks in the Asia and Pacific (Lee and Hsieh, 2013). Furthermore, compliance status of Basel accord around the world differs a lot. Regulators of banks in numerous countries are still in the rudimentary stage of implementing Basel accord II, let alone Basel accord III. Due to varied

implementation status of the accord and having contextual status, the earlier results may not be effective or applicable in Asian markets. As, each economy is of very distinct type, Lee and Hsieh (2013) highlighted that unsystematic risk often can be more influential than systematic risk. Dietrich & Wanzenried (2014) tried to explore the relationship between profitability and characteristics of various bank specific variance, numerous industry specific factors of high, middle and low income countries, other macroeconomic variables. They conducted an enormous study on 10,165 commercial banks of 118 countries around the globe. The study summarized that the factors of profitability may vary extensively across the varied level of income in relation to magnitude, sign and significance of the effect. The profitability is very dependent on the level of income of the bank.

Regardless of various critics on the characteristics, dynamics and nature of capital requirement in relation to profitability, still numerous banks are willing to hold extra capital adequacy ratio to its total assets in order to safeguard its position from probable financial crisis. Barrios and Blanco (2003), conducted a study on the Spanish banks attempted to hold higher capital adequacy ratio than the ratio suggested by Basel accord. In their studies, they tried to compare between their own discovered model of maximum capital adequacy and regulatory model of capital adequacy. Enigmatically, they found that market based model may refer different outcome from the regulatory level of capital. They concluded that market based model can best identify the underlying reasons of holding higher capital by banks, in spite of having some effect of regulatory framework on determination of optimal capital. Unambiguously, they highlighted numerous market factors or variables like size of the bank, operating revenue, liquidity premium, cost variance, return on assets, credit quality, market risk etc. measure the optimal capital ratio rather than regulatory directions.

On the basis of evaluation of the above arguments, critics, discussions, debate on the type of relationship between profitability and minimum capital requirement, it is imperative to the regulators of bank and other financial institution of Bangladesh, to walk around the relationship and effect of capital on bank's profitability. Thus, this study has been conducted to explore the potential sign of relationship between profitability and capital on the basis of analysis of the financial performance of the listed commercial banks operating in Bangladesh.

3. Framework of Basel-I Accord

BCBS announced Basel I in 1988 with the requirement of minimum capital of 8% of the total risk weighted assets. The accord was widely welcomed by more than 100 countries all over the world and initiated practicing since 1988. Rime (2005); Cumming and Nel (2005) highlighted that the adaptation of the accord enhanced the resilience of global banking system through the holdings of standard level of capital. Actually, the financial crisis of 1970s prompted the formulation of the accord, so that banks and financial institutions can lessen their level of systematic risk and face credit and other types of risk with more capital and strength (Dobson and Hufbauer, 2001).

Though the accord was widely accepted in many countries, it was criticized for its structure like- one size fits all method of capital requirement and risk management (Ong, 2004; Hai et al., 2007). Further, the global expansion and integration of financial institutions and innovation of new products and services had led the restructure and revision of the accord with new guidelines.

According to the circular and guidance of Banking Regulation and Policy Department (BRPD) of the Bangladesh Bank, Basel I was initiated practicing in 1996. Basel committee published the first rudimentary draft of Basel II in 1999, second draft in 2001 and the final draft in 2004. Banks in Bangladesh initiated parallel following of the guidelines of Basel II from January 1, 2009 and full-fledged application started from January 01, 2010.

3.1 Framework of Basel-II Accord

The rudimentary aim to implement the new capital adequacy accord is to ensure the strength and capacity of banks, so that banks can withstand a great number of risks appropriately while dealing its operation. This accord was structured basing three pillars such as Pillar-I (minimum capital requirement), Pillar-II (Supervisory review) and Pillar-III (market discipline).

3.1.1 Pillar I - Minimum Capital Requirement

This pillar measures the minimum level of capital adequacy considering three types of risk like credit risk, operating risk and market risk. Identical definition is also applicable in case of eligible capital as per the guidance outlined in Basel I accord, 1988. Banks need to hold minimum capital of 10% on its total risk weighted assets.

In case of measuring credit risk, two methods can be applied; *Standardized Approach (SA)* and *Internal Rating Based (IRB) Approach.* Under the *Standardized Approach,* ECAIs following all standards set by national supervisor, compute the credit risk of the banks and measure the level of eligible capital. In case of *IRB Approach* banks use their own techniques and measurement scale to classify borrowers based on their creditworthiness and probable losses from default of the borrower. Again, the accord described two different

types of IRB approach: *Foundation Internal Ratings Based (FIRB)* and *Advanced Internal Rating Based (AIRB)*. In the former approach banks primarily estimate Probability of Default (PD) and then rely on supervisors for other estimates like *Loss Given Default (LGD), Exposure at Default (EAD), and Maturity (M)*. In the latter approach, banks compute all the above four estimates based on its own measurement scale to comply with capital standards (Kabir, 2005).

Basel II accord also advises the allocation of capital for operational risk. It may upgrade the effectiveness of Basel II as banks need to calculate the operating efficiency and the probable volume of losses due to imperfect internal process, failure of the internal system, errors of the employees etc. In Bangladesh, basic indicator approach is used to measure the capital charge for operational risk, which is calculated by the formula $K= [\{(GI1+GI2+GI3)*\alpha\} /n]$; where, K stands for capital charge under BIA; GI stands for positive annual gross income over the last three years; α stands for 15% and n stands for number of previous three years for which gross income is positive (BRPD, 2010, BB).

Besides insuring allocation to capital charge for credit risk and operational risk, Basel accord also insures to allot to capital charge for market risk that may originate from various on and off balance sheet operations of the banks due to volatility of prices. Some of those risks are *interest rate risk, foreign exchange risk and commodity risk*. Basel II accord contains the guidance of different methods of valuation of market risk, provision for adequate systems, verification of reserves, etc. *Standardized Measurement Method* and the *Internal Model Approach* are popularly used for assessing market risk.

3.1.2 Pillar II - Supervisory Review

Besides, giving importance on holding adequate capital to withstand risks, Basel II accord infers banks to apply effective risk management approaches for reducing the density of risk. Regulators of banks should also be careful to the evaluation of the propriety of the board and management of the bank, strategic planning and actions of the bank, optimum diversification of portfolio and risk mitigation techniques. In addition, other concerns like corporate governance structure, transparency in operations and market efficiency of banks should be evaluated by the supervisor as a challenge to the enforcement of the Basel II accord.

3.1.3 Pillar III - Market Discipline

Nowadays, the operations of banks have been diversified like the risks. As a result, it has become troublesome for the regulator to monitor and control the banking industry (Ahmed M. Kabir, 2005). For this reason, Basel Committee realized the importance of this pillar of market discipline which obligates banks to publish regular reports on operation and scenario so that, both supervisors and its stakeholders such as investors, depositors, clients, rating agencies etc. can learn about the level of risk in banks.

4. Methodology and Research Type

A great deal of studies has highlighted the impact of the adaptation of Basel accords of capital adequacy on both countries with emerging and advanced economy, analyzing the performance of the commercial bank (Berger and Udell, 1994; Peek and Rosengran, 1995). This study has focused the impact of maintaining minimum capital adequacy on the profitability of the commercial banks in Bangladesh. This paper can be classified as descriptive nature of research.

4.1 Data and Sample

In this study, data source includes secondary sources such as annual financial statements from the websites of the commercial banks operating in Bangladesh, website of the central bank (Bangladesh Bank) and Dhaka Stock Exchange (DSE) library. Observations have been accumulated from the financial statements of individual bank for the period of 2007 to 2014. Sample covers 29 commercial banks listed with the Dhaka Stock Exchange. For statistical analysis of panel data, IBM SPSS (version-20) has been applied.

4.2 Research Hypothesis

This study has been conducted on the basis of a couple of hypothesis, those are given as follows:

H1: There is a significant relationship between capital adequacy ratio and bank's profitability. Banks have to hold a minimum level of capital as per the guideline of the regulators. So, it may have impact on the profitability.

H2: There is a significant impact of operating efficiency on profitability. Operating expenses covers the major portion of cost of a bank. That's why level of operating expense may affect the profitability of a bank.

H3: Size of bank's asset has significant effect on the magnitude of profit. Bank with large volume of asset may enjoy economies of scale. As a result, profitability is also related to the asset size of a bank.

H4: There exists a significant relationship between total loans and profitability. Loans and advances are a major source of income to a bank. Bank converts the deposits of its customers into either loan or investment. So, it has a significant impact on profitability.

H5: Debt to total asset ratio has a significant effect on profitability. Deposit covers the major portion of debt to a bank. Bank has to pay interest to its depositors. So, profitability depends on the effective use of this debt.

4.3 Model Followed

In this study, two widely used proxies for profitability; Return on Asset (ROA) and Return on Equity (ROE) have been considered as a response variable in two separate models to evaluate the effect of different explanatory variables including the capital adequacy ratio under Basel II.

ROA= *f (*RCRWA, OVRHDTA, LNTA, TLOTA, DBTA)

ROE= *f* (RCRWA, OVRHDTA, LNTA, TLOTA, DBTA)

Here, five explanatory variables have been used to assess their effect on the bank profitability in the context of commercial banks in Bangladesh. Variables include capital adequacy ratio (RCRWA), operating efficiency ratio (OVRHDTA), log of total bank assets (LNTA), total loans to total asset (TLOTA) and debt to total asset (DBTA). ROA and ROE as response variable, the basic core panel regression models are given as follows:

$ROA_{it} = a_0 + b_1\, RCRWA_{it} + b_2\, OVRHDTA_{it} + b_3\, LNTA_{it} + b_4\, TLOTA_{it} + b_5\, DBTA_{it} + \varepsilon_i$ (M_1)

$ROA_{it} = a_0 + b_1\, RCRWA_{it} + b_2\, LNTA_{it} + b_3 TLOTA_{it} + b_4\, DBTA_{it} + \varepsilon_i$ (M_2)

$ROA_{it} = a_0 + b_1\, RCRWA_{it} + b_2\, OVRHDTA_{it} + b_3\, TLOTA_{it} + b_4\, DBTA_{it} + \varepsilon_i$ (M_3)

$ROA_{it} = a_0 + b_1\, RCRWA_{it} + b_2\, OVRHDTA_{it} + b_3\, LNTA_{it} + b_4\, DBTA_{it} + \varepsilon_i$ (M_4)

$ROA_{it} = a_0 + b_1\, RCRWA_{it} + b_2\, OVRHDTA_{it} + b_3\, LNTA_{it} + b_4\, TLOTA_{it} + \varepsilon_i$ (M_5)

As like ROA, above five models have been testified against ROE as a response variable, which is also considered as a proxy to quantify bank's profitability.

5. Empirical Analysis and Findings

In this this section, empirical findings on the determinants of banks' profitability (ROA and ROE) have been grounded on balanced data typically, panel type where observations of the variables have been accumulated for each cross section and for the time period of eight years (2007-2014). Among 56 scheduled banks, 30 are listed with DSE and the sample data of this study covers 29 of those listed banks. These sample banks' aggregate asset is approximately 62% of total banking sector balance sheet size (Financial Stability Report, Bangladesh Bank, 2014). In this study, two econometric models have been assessed by bank specific variables. In this study, Ordinary least square (OLS) method has been used for panel regression.

5.1 Descriptive Statistics

Table 1: Summary Statistics of the Variables

Title of the Variables	Mean	Median	Maximum	Minimum	Standard Deviation
Return on Asset (ROA)	0.015	.014	0.073	-0.135	0.013
Return on Equity (ROE)	0.174	.164	0.490	-0.010	0.083
Regulatory Capital to Risk Weighted Assets (RCRWA)	0.113	.115	0.186	-0.297	0.039
Overhead to Total Assets (OVRHDTA)	0.022	.021	0.046	0.011	0.007
Natural Logarithm of Bank's Total Asset (LNTA)	11.494	11.556	13.388	10.041	0.622
Total Loans to Total Asset (TLOTA)	0.680	.683	0.825	0.466	0.029
Debt to Total Asset (DBTA)	0.919	.918	1.129	0.846	0.068
N	232	232	232	232	232

From the table of descriptive statistics, it is shown that banks in the sample have a mean return on asset (ROA) 0.015 with standard deviation of 0.013 and return on equity (ROE) 0.174 with standard deviation of 0.083. Moreover, banks in the sample have an average capital adequacy ratio of 0.113 with standard deviation of .039, against required capital adequacy ratio under Basel II accord. This implies that banks are capitalized strongly enough to deal with any crisis in the both short and long run.

5.2 Model Judgment

Under the fulfillment of OLS assumptions, both ROA and ROE models have been estimated against explanatory variables; such as regulatory capital to risk weighted assets (RCRWA), overhead to total assets (OVRHDTA), natural logarithm of total bank assets (LNTA), total loans to total asset (TLOTA) and debt to total asset ratio (DBTA).

Table 2: Determinants of Profitability (ROA)

Title of Explanatory Variables	Model (M_1) Coefficients	Model (M_2) Coefficients	Model (M_3) Coefficients	Model (M_4) Coefficients	Model (M_5) Coefficients
Regulatory Capital to Risk Weighted Assets (RCRWA)	0.074*** (0.026)	0.077*** (0.026)	0.086*** (0.026)	0.075*** (0.026)	0.175*** (0.018)
Overhead to Total Assets (OVRHDTA)	0.171* (0.101)	---	0.182* (0.101)	0.065 (0.095)	0.188* (0.106)
Natural Logarithm of Bank's Total Asset (LNTA)	-0.003*** (0.001)	-0.003*** (0.001)	---	-0.004*** (0.001)	-0.001 (0.001)
Total Loans to Total Asset (TLOTA)	0.031*** (0.011)	0.024** (0.010)	0.038*** (0.011)	---	0.039*** (0.011)
Debt to Total Asset (DBTA)	-0.187*** (0.036)	-0.189*** (0.036)	-0.160*** (0.035)	-0.201*** (0.036)	---
Constant	0.189*** (0.043)	0.200*** (0.043)	0.122*** (0.036)	0.234*** (0.041)	-0.019 (0.017)
R-square	0.418	0.411	0.400	0.398	0.348
Adjusted R-square	0.405	0.400	0.389	0.387	0.337
Durbin-Watson d Statistic	1.976	1.954	1.912	1.929	1.765
F- Statistic	32.496	39.568	37.772	37.473	30.317
P-Value	0.000[b]	0.000[b]	0.000[b]	0.000[b]	0.000[b]
N	232	232	232	232	232

*Notes: (i) Standard errors are shown in the parenthesis. (ii) D-W d statistic closer to 2 infers evidence in favor of no autocorrelation and d must be within ($0 \leq d \leq 4$), (iii) *, ** and *** symbolize significant levels of 10%, 5% and 1% respectively.*

Table 2, denotes ROA model which shows that regulatory capital to risk weighted assets (RCRWA) has positive highly significant relationship with ROA at 1% level of significance. It implies that well capitalized banks are profitable; or banks with higher capital can collect funds at a cheaper rate with minimal risk which ultimately, enhances profit level (Bourke, 1989). Several studies (Berger,1995; Dermerguç-Kunt and Huizingua, 1999; Hassan, Kabir et al., 2005; Vong and Chan, 2006) have also found positive relationship between profitability and its holdings of capital.

Like Bennaceur and Goaied (2008), this study has also found positive relationship between overhead to assets ratio variable (OVRHDTA) in the ROA equation. The positive overhead variable signifies that bank can transfer their overhead expenses to depositors and lenders through offering lower deposit rate and higher lending rate. Moreover, the practice of ATMs, and other types of automated machines for delivering banking service have reduced the level of wage expenses. Therefore, like this study findings, a lower level of OVRHDTA ratio may affect ROA positively (Hassan, Kabir et al., 2005).

However, Clarke et al. (1984) presumed that banks with greater assets are more efficient than banks with low level of assets. Though, many a researcher have found positive relation between profitability of a bank and its total assets through presenting the theory of economies of scale, other studies like Athanasoglou et al. (2005) found inverse significant relation between LNTA and ROA. Berger et al. (1987) claimed that very few amount of expenditure can be saved thorough increasing size of asset of a bank. Larger size of assets may cause diseconomies of scale in a bank (Athanasoglou et al., 2005).

Corresponding to other studies' (Demirguc and Huizinga, 1998; Hassan, Kabir et al., 2005) findings, this study has also proved positive significant relationship between TLOTA and profitability of banks. Loans are considered the major source of income to a bank and assumed to affect profitability positively (Alshatti, 2016). This study has also showed significant positive relationship between DBTA and ROA as like the study conducted by Ahmed S.U. et al. (2015) on the commercial banks of Bangladesh.

Table 3: Determinants of Profitability (ROE)

Title of Explanatory Variables	Model (M_1) Coefficients	Model (M_2) Coefficients	Model (M_3) Coefficients	Model (M_4) Coefficients	Model (M_5) Coefficients
Regulatory Capital to Risk Weighted Assets (RCRWA)	-0.037 (0.188)	.014 (0.195)	0.091 (0.191)	-0.023 (0.199)	0.176 (0.126)
Overhead to Total Assets (OVRHDTA)	3.143*** (0.732)	---	3.261*** (0.756)	1.674** (0.720)	3.179*** (0.734)
Natural Logarithm of Bank's Total Asset/Size (LNTA)	-0.033*** (0.008)	-0.035*** (0.009)	---	-0.045*** (0.009)	-0.030*** (0.008)
Total Loans to Total Asset (TLOTA)	0.428*** (0.079)	0.301*** (0.076)	0.507*** (0.079)	---	0.444*** (0.079)
Debt to Total Asset (DBTA)	-0.399 (0.261)	-0.435 (0.271)	-0.102 (0.259)	-0.590** (0.274)	---
Constant	0.567* (0.314)	0.768** (0.322)	-0.161 (0.265)	1.193*** (0.309)	0.123 (0.120)
R-square	0.239	0.177	0.185	0.141	0.231
Adjusted R-square	0.222	0.162	0.170	0.126	0.218
Durbin-Watson d Statistic	1.002	.945	.965	.947	1.007
F- Statistic	14.194	12.202	12.850	9.34	17.058
P-Value	0.000[b]	0.000[b]	0.000[b]	0.000[b]	0.000[b]
N	232	232	232	232	232

*Notes: (i) Standard errors are shown in the parenthesis. (ii) D-W d statistic closer to 2 infers evidence in favor of no autocorrelation and d must be within ($0 \leq d \leq 4$), (iii) *, ** and *** symbolize significance levels of 10%, 5% and 1% respectively.*

Similar to other researchers (Hassan, Kabir et al., 2005), ROE model of this study have found inverse relationship between RCRWA and ROE in M_1 and M_4 model. Those studies also highlighted that bank's performance can be negatively contributed by equity portion in the financing of total assets. Ahmed, S. U., (2015) also identified inverse relationship between RCRWA and ROE while analyzing performance of commercial banks in Bangladesh. In case of M_2, M_3 and M_5 model, while dropping one explanatory variable show positive relationship between RCRWA and ROE. Both OVRHDTA and TLOTA have significant positive impact on profitability. Other regression results of the explanatory variables are related to profitability as like as the preceding model ROA and supported by previous studies of other researchers.

6. Conclusion

It is ubiquitously believed that a resilient and vigorous banking system is a must for sustainable economic growth. Banks in Bangladesh have been enduring key challenges in the vibrant operating environment since the preceding decade. With a view to resisting adverse shocks and sustain stability in the financial sector, it is imperative to find out the major elements that typically affect the overall performance of banks in Bangladesh.

This paper investigated the Basel II implication and key profitability determinants that have major influence on the banks of Bangladesh. It has been found that the mean capital adequacy ratio is 11.3% which is greater than the regulatory requirement under Basel II accord. The preceding empirical judgment shows the relationship of bank specific features and measures of performance of banks. It has been found that capital adequacy ratio has positive effect on the profitability measures of banks. It discloses the fact that higher the capital adequacy, higher will be the profit. Again, banks that earn high profit may incur high level of expenses in wages and salaries. This study has also found positive relationship between operating efficiency and profitability. Banks with larger assets need to be prudent enough to remove scale inefficiency and engage assets to enhance the profit level. In addition, profitability responds positively to the ratio of loan to asset and inversely to debt to asset. Negative relation between debt to asset and profitability infers that banks are failing to make the best use of its deposits collected from customers. So, it is recommended that deposits are needed to be reinvested at higher spread which will ultimately enhance the profitability of banks.

This paper has also found several irrelevant relationships between variables which rise doubt on risk assessment mechanism in the capital adequacy model and compliance of the Basel II accord in Bangladesh. So, the central bank and other regulators should assure that all banks operating within the territory of the country will respond to the minimum capital adequacy ratios accordingly, in order to robust its sustainable financial health and growth.

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Appendix A: Profile of the Variables

Title of the Variables	Representation	Measurement	Explanation	Literature
Return on Asset	ROA	Net Profit after Tax / Total Asset	It measures the effective utilization of assets of a bank in order to generate higher profits.	S.Bennaceur and M. Goaied (2003), Hassan M.Kabir et al. (2005), Anna Vong and Chan (2006).
Return on Equity	ROE	Net Profit after Tax / Total Shareholder's Equity	Determines how well the bank has engaged its capital in investment.	S.Bennaceur and M. Goaied (2003), Hassan M.Kabir et al. (2005).
Capital Adequacy Ratio	RCRWA	Total Risk-based Capital / Total Risk Weighted Asset	Shows the volume of capital hold by bank as a requirement of Basel accord.	Hassan M.Kabir et al. (2005), Hutchison and Cox (2006), Ahmed S.U. et al. (2015).
Operating Efficiency	OVRHDTA	Overhead / Total Asset	How efficient the bank is in managing the firm?	Hassan M.Kabir et al. (2005), S.Bennaceur and M.Goaied (2003).
Natural Logarithm of Bank's Total Asset	LNTA	[LN(1+TA)]	Size of asset may lead a bank to a larger investment.	S.Bennaceur and M. Goaied (2003), Ahmed S.U. et al. (2015), Alshatti A. S. (2016).
Total Loans to Total Asset	TLOTA	Total Loans / Total Asset	Among total assets, how much profit is contributed by loans and advances?	S.Bennaceur and M. Goaied (2003), Hassan M.Kabir et al. (2005), Vong and Chan (2006).
Debt to Total Asset	DBTA	Debt / Total Asset	Indicates the volume of assets that is financed by both short and long term liabilities.	Hassan M.Kabir et al. (2005), Ahmed S.U. et al. (2015).

Appendix B: Asset Scenario of the Sample Banks of This Study for the Year of 2014

Figures in Million				
No	Name of Bank	Individual Bank Asset (IBA)	Total Bank Asset (TBA)	IBA/TBA
1	AB Bank Limited	246331	9143000	2.69
2	Al-Arafah Islami Bank	210439	9143000	2.30
3	Bank Asia Limited	182,731	9143000	1.99
4	Brac Bank Limited	204,592	9143000	2.24
5	City Bank Limited	177228	9143000	1.94
6	Dutch-Bangla Bank Ltd.	215994	9143000	2.36
7	Dhaka Bank Limited	158748	9143000	1.74
8	Eastern Bank Limited	172124	9143000	1.88
9	EXIM Bank Limited	232412	9143000	2.54
10	First Security Islami Bank	204513	9143000	2.24
11	IFIC Bank Limited	156339	9143000	1.71
12	Islami Bank Limited	652422	9143000	7.14
13	Jamuna Bank Limited	139495	9143000	1.53
14	Mercantile Bank Limited	168474	9143000	1.84
15	Mutual Trust Bank Ltd.	116301	9143000	1.27
16	NCC Bank Limited	135160	9143000	1.48
17	National Bank Limited	256537	9143000	2.81
18	One Bank Limited	121820	9143000	1.33
19	Prime Bank Limited	254912	9143000	2.79
20	Premier Bank Limited	111576	9143000	1.22
21	Pubali Bank Limited	248386	9143000	2.72
22	Rupali Bank Limited	268078	9143000	2.93
23	Shajalal Islami Bank Ltd.	126758	9143000	1.39
24	Social Islami Bank Ltd	153737	9143000	1.68
25	Southeast Bank Limited	236608	9143000	2.59
26	Standard Bank Limited	119932	9143000	1.31
27	Trust Bank Limited	145346	9143000	1.59
28	United Bank Limited	266101	9143000	2.91
29	Uttara Bank Limited	140810	9143000	1.54
Total Asset		5683094	9143000	62.16

Source: Financial Stability Report (2014) of Bangladesh Bank and Annual Reports of the Sample Banks.