BBTA Journal

Thoughts on Banking and Finance

Volume 7 Issue 2
July-December, 2018

Bangladesh Bank Training Academy
Mirpur-2, Dhaka-1216

BBTA Journal

*T*houghts on *B*anking and *F*inance

Volume-7, Issue-2
July - December, 2018

Published : January-2021

Bangladesh Bank Training Academy
Mirpur-2, Dhaka-1216

BBTA Journal

Thoughts on Banking and Finance

(A Journal of Bangladesh Bank Training Academy)

Volume-7, Issue-2
July - December, 2018

Published : January - 2021

ISSN - 2517-9918

For all sorts of correspondence :

The Executive Editor
BBTA Journal "Thoughts on Banking and Finance"
Research and Publications Wing

Bangladesh Bank Training Academy (BBTA)
Bangladesh Bank, Head Office, Mirpur-2, Dhaka-1216, Bangladesh
Phone : 880-2-48040816, Fax : 880-2-8032110
E-mail : bbta.respub@bb.org.bd

Price : Inland BDT 200.00
Foreign US$ 3.00

Contents

Editorial Note

Bangladesh Bank Training Academy (BBTA) continued it's publishing the journal 'Thoughts on Banking and Finance' including research articles covering a broad spectrum of macroeconomic and financial issues that are most substantial to policymakers as well as to research and academicians.

Topics included in this issue are: Testing Investment led Income Growth in Bangladesh. An Empirical Investigation, Comparative Advantage and Export Potential for Bangladesh in the World, the EU-West Europe, and the USA Markets: An Empirical Analysis, Effectiveness of Macroprudential Policy in Bangladesh, Efficiency Estimation of Private Commercial Banks in Bangladesh: Application of DEA Approach Using Panel Data, Financial Development and Economic Growth in Bangladesh: Empirical Evidence from ARDLCointegration and Granger Causality Analysis, The Role of Small and Medium Enterprises (SMEs) Loans on Employment Generation: Bangladesh Perspective, Exchange Rate Movement and International Reserve Position in the Floating Exchange Rate Regime of Bangladesh and Developing a Digital Payment Systems in Bangladesh.

The first paper 'Testing Investment led Income Growth in Bangladesh. An Empirical Investigation' empirically examines the impact of investment on the per capita income growth in Bangladesh within the period of 1980 to 2018 and tries to explore the causal effects of total debt to investment and per capita income and inflation to per capita income in Bangladesh. The results of Joahansen Juselius co integration test confirm long run relationship among per capita income, investment, total debt and inflation. According to the causality test results, there exist no causal effects from investment and inflation to per capita income growth in Bangladesh. Moreover, the results also revealed that the escalating total debt has no positive impact on investment and per capita income in Bangladesh. The study, therefore, recommends some policy reforms particularly on the ground to accelerate investment specifically on the productive sector and to pay high concentration on the efficient debt management.

The second paper 'Comparative Advantage and Export Potential for Bangladesh in the World, the EU-West Europe, and the USA Markets: An Empirical Analysis' investigates comparative advantage and the export potential for the major competing countries i.e. India, Sri Lanka, Vietnam, Pakistan, China, Cambodia and Turkey along with export potential sectors and products of Bangladesh. The Revealed Comparative Advantage analyzes the extent of comparative advantage between Bangladesh and its major competitors. The Export Potential Assessment identifies the export potential from Bangladesh to the world market. Apparel sector has the highest export potential sector in value terms. Most of the sectors and product potentials have already been utilized, especially in the EU–West Europe (Bangladesh's export share 56 percent) and the USA (Bangladesh's export share 17 percent) markets. The findings are expected to contribute to extract untapped export potential that may help to take next step by increasing the export volume to the respective potential markets as well as products.

The third paper 'Effectiveness of Macroprudential Policy in Bangladesh' examines the uses of micro as well as macroprudential tools by Bangladesh Bank as complementary to monetary and exchange rate policies such as prudential regulations for consumer finance and small enterprise

financing, provision against loans and advances, time-varying capital requirement and risk weights against various assets, open position limit etc. There appears to be a lack of dynamism in adopting key macroprudential tools to counter procyclical behavior of the banking sector, while lack of effective coordination between monetary policy measures and macroprudential tools was also observed. Macroprudential regulations of BB partially contributed to check overexposure of the banking sector to capital market at the cost of a sudden crash at the end of 2010, but failed to rein in excessive credit growth during 2010-12 and consumer credit growth during 2015-17. A reduction in provision for standard SME credit in 2012, supported growth in SME credit disbursement contributing to diversifying risks in the banking sector. Some relaxations in prudential norms for residential housing loans have positive impact on growing home loan.

In the fourth paper 'Efficiency Estimation of Private Commercial Banks in Bangladesh: Application of DEA Approach Using Panel Data' the use of Data Envelopment Analysis (DEA) technique is illustrated in measuring the operational efficiency of the banking sector in Bangladesh, which currently has 58 scheduled banks. State-owned banks and foreign commercial banks have not been considered. Five-year panel data (2013 to 2017), collected from the secondary sources, have been used to model the efficiency of different banks. The DEA results show that Islamic banks are slightly more efficient than conventional banks. While, among the conventional banks, public conventional banks are the least efficient. The returns to scale estimation show that both conventional and Islamic banks in Bangladesh have still scope of improvement in scale efficiency. Second stage regression results also indicate that Return on Asset (ROA) have significant contribution on efficiency level of the private commercial banks. It is also revealed that first-generation banks are efficient over second, third and fourth generation banks; while second generation banks are better than third and fourth generation banks.

The main objective of the fifth paper'Financial Development and Economic Growth in Bangladesh: Empirical Evidence from ARDLCointegration and Granger Causality Analysis' is to examine the empirical cointegration, long and short run dynamics and causal relationships between financial development and economic growth in Bangladesh over the period 1973 to 2015. Using three different indicators for financial development in the growth form, namely: the ratio of broad money (M2) to GDP, the ratio of total deposit liabilities to GDP, and the ratio of total trade (export plus import) to GDP, the ARDL bounds tests as well as additional cross-checking test convincingly confirmed long run cointegration between economic growth and financial development indicators in Bangladesh. The estimated long run and short run results indicate that, growth in the total trade ratio has insignificant impact on economic growth. However, growth in broad money to GDP ratio and growth in total deposit liabilities to GDP ratio appeared to have time variant impact on economic growth: the former having significant positive impact in the short run but negative in the long run, while the latter has significant negative impact in the short run but positive in the long run on economic growth. On the whole, Granger causality analysis indicated a bidirectional, co-evolutionary process between financial development and economic growth in the context of Bangladesh.

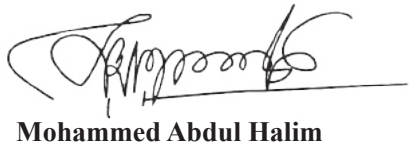
The sixth paper 'The Role of Small and Medium Enterprises (SMEs) Loans on Employment

Generation: Bangladesh Perspective' examines the contributions of bank loans to Small and Medium Scale Enterprises (SMEs) in employment generation in Bangladesh. This is because the sector serves as a catalyst for employment generation, poverty reduction and economic development as well. The aim of this study therefore; is to find out the relationship between employment and SME Financing. Using panel data analysis with a sample of 310 enterprises for the period 2009-2011, the paper shows that SME loans has a positive impact on employment generation

The Seventh paper 'Exchange Rate Movement and International Reserve Position in the Floating Exchange Rate Regime of Bangladesh' examines the exchange rate performance on the reserve accumulation of Bangladesh in the floating regime. Using quarterly time series data (2003-2018), this paper has attempted to explore the influence of exchange rate on foreign exchange reserves by employing standard econometric techniques in Bangladesh economy. The findings of the empirical analyses reveal that although the nominal exchange rate changes and reserve growth relationship is not empirically established; however, from the economic point of view, the floating exchange rate regime has an important implication on the macroeconomic behavior of Bangladesh economy.

The eighth paper 'Developing a Digital Payment Systems in Bangladesh' discussed on present digital payment system in Bangladesh, its advantages, disadvantages and limitations. Policy Recommendations to digitize domestic payment system are: developing a unique identification program in a centralized database that both public and private sector players can access to verify identities, implementing strict monitoring systems to prevent illegal money transaction, establishing an appropriate consumer protection framework, promoting product understanding and consumer education, improving regulatory environment, implementing interoperability among the platforms, Promoting merchant acceptance infrastructure, leveraging existing networks quickly to far-reaching areas, digitizing all government receipts & payments and merchant payments, and adopting appropriate cyber security measures.

Finally, I would like to express my heartfelt thanks to authors, reviewers, the editorial advisory board, and the members of the editorial board of BBTA Journal. Our effort will be worthwhile if the articles published in this issue prove to be useful to readers. We appreciate constructive criticism and feedback for further improvement of the journal in future.



Mohammed Abdul Halim
General Manager &
Executive Editor
BBTA Journal: Thoughts on Banking and Finance

Testing Investment led Income Growth in Bangladesh. An Empirical Investigation

Mamun Chowdhury[1]

Abstract

The study empirically examines the impact of investment on the per capita income growth in Bangladesh within the period of 1980 to 2018. The paper also tries to explore the causal effects of total debt to investment and per capita income and inflation to per capita income in Bangladesh. This research uses Joahansen Juselius co integration method to establish the long run relationship among the variables. The study also employs Toda-Yamamoto augmented Granger causality test to find the direction of causality among the variables. The results of Joahansen Juselius co integration test confirm long run relationship among capita income, investment, total debt and inflation. According to the causality test results, there exist no causal effects from investment and inflation to per capita income growth in Bangladesh. Moreover, the results also revealed that the escalating total debt has no positive impact on investment and per capita income in Bangladesh. The study, therefore, recommends some policy reforms particularly on the ground to accelerate investment specifically on the productive sector and to pay high concentration on the efficient debt management.

Key words: Per Capita Income, Investment, Bound Test, Co integration, Causality

JEL Classification: C22, C87, E22, E25 H63

[1] Assistant Professor, Department of Economics, Jagannath University, Dhaka. Email: Chowdhurym31@yahoo.com

1. Introduction

The importance of inclusive and consistent income growth has significantly been prioritized in many theoretical and empirical literatures and also in the strategies of Sustainable Development Goals (SDGs). Due to the growing problems of income inequality, poverty and hunger in the lower developing countries, the issue of sustainable and equitable income growth has now become a leading development agenda in the so called development programs such as MDGs and SDGs. However, in Bangladesh, the income growth is increasing. Recently, the country have achieved the status of lower middle income country and also targeting to be a middle income country by 2021 and to be in line of rich country by 2041. Hence, Bangladesh needs to emphasize on the quality of income growth. The increase in total investment in the country literally would strengthen the quality of income growth as it will create employment opportunities to even the remote areas in the country. In this backdrop, the main objective of this study is to empirically appraise whether the growth of per capita income in Bangladesh is investment oriented or not.

Now, what is the rationale behind this study? The answer generally explains the following two reasons. First, despite investment growth is a leading factor to measure the quality of income growth, the statistics shows that the investment proceeds slowly compare to the income growth in Bangladesh. As stated by Raihan (2016) that Bangladesh stands on the worst position among all middle income countries in the field of public investment growth which is a solid sector to contribute to health and education. Hence, the paper has intended to find out the causality running from investment to income growth in Bangladesh. Second, theoretically, some key macroeconomic variables such total debt, inflow of remittances, foreign direct investment, disbursement of bank credit and inflation rate can put a serious effect on the performance of investment growth. On the contrary, the mismanagement of remittances and foreign direct investment can impede productivity growth. Likewise, the inefficient uses of debt and inflation rate are also more destructive for the economy as debt has to be repaid with interest and inflated price level slowed down productivity growth by raising interest rate. The work of Chisty, et al. (2015), however, in this case can be sited as an example. They showed some significant impact of inflation on the variation of per capita income in the economy of China and Russia. Furthermore, Ilyas, et al. (2014) have also found some positive impact of inflation and negative impact of deflation on the economic growth of Pakistan.

In this backdrop, the main objective of this paper is to empirically examine the effects of investment to per capita income in Bangladesh. Furthermore, the paper is also tried to find the causal effects of total debt and inflation on the investment and per capita income. The paper has incorporated total debt and inflation because of their significance on the influence of investment and per capita income in Bangladesh. For example, compared to other key variables, total debt is increasing rapidly. Hence, total debt should be utilized properly to put some positive impacts on investment and per capita income. Consequently, the inflation, as evident in many theoretical and empirical works, has also some significant effects on investment. The contemporary economic theory says that the increase in inflation raises the general rate of interest and thereby slowed down investment demand. Moreover, the Fisher effect also draws a positive relationship between inflation rate and nominal interest rate. Furthermore, it is important to note that due to deflationary effect, the real per capita income can be healthier in the short run in such a stagnant investment performance in Bangladesh.

However, the present study uses Johansen Juselius co integration approach to test the long run relationship among Per Capita Income (PCI), Total Investment (TI), Consumer price Index (CPI) which is used as a proxy variable of inflation Total Debt (TD). Furthermore, Toda-Yamamoto Augmented Granger Causality test is employed to find the direction of causality among the variables.

The rest of the paper is structured as follows. Section 2 reviews both empirical and theoretical literature on the relevant issues after the introduction in section 1. Section 3 provides theoretical framework while section 4 describes data and methodology of the study. The empirical results are stated in section 5 and the paper concludes with some policy recommendations in section 6.

2. Literature Review

Income is an important determinant to measure the standard of living of the people. The aggregation of income, however, by many classical and contemporary economic theories depends on investment. While acceleration of investment has positive impact on income, as stated by contemporary economic theory, raising the general price level impacts adversely on income by lowering the purchasing power. Hence, in the literature review, the paper highlights separately on the works on investment income growth and inflation income growth relationship. Moreover, as debt is a significant source of development fund in Bangladesh, the paper also explores debt income literatures.

2.1. Investment and Income growth Relationship

The theoretical and empirical literature focusing on the relationship between investment, income and economic growth is plenty around the globe. However, it is necessary to mention here that, for Bangladesh, especially the relationship between investment and income growth is quite nascent. Fagbohun et al (2016) has investigated the effects of investment on long run per capita income growth in Nigeria for the period of 1970 to 2014. They employed the Ordinary Least Square (OLS) and concluded that investment and other macroeconomic determinants dictate the movement of per capita income in Nigeria. Adetiloye and Adeyemo (2012) also explored the impact of investment on per capita GDP in Nigeria. He found that the rate of investment does not assist the rate of growth of per capita in Nigeria. Hasan and Murtala (2016) have examined the phenomena of per capita income convergence across a panel of ASEAN-5 economies. They also investigated the effects of public and private investment on per capita income convergence among the countries. By using GMM estimation, they found that domestic investment plays a significant role in augmenting per capita income in ASEAN-5 countries. They concluded that government in ASEAN-5 countries should strengthen the existing investment related policies and should create the new incentive based policies that facilitate per capita income convergence among the above countries. Churchil, et al (2015) explored the impact of government expenditure on the per capita income based on 87 empirical studies. By using a hierarchical meta-regression analysis, they found negative association between government expenditure and per capita income. Similarly, Makuyana and Odhiambo(2016) have reviewed theoretical and empirical research to explore the impacts of public and private investment on economic growth in both developed and developing countries. They have concluded that public investment is important in developed countries particularly to improve the infrastructure that will stimulate the private investment and economic growth. In developing countries, they argued both public and private investment have positive impact on the economy. Hasan and Murtala(2016) and Abulrahman (2015) has investigated the empirical relationship between investment and economic growth for Sudan economy and identified positive impact of investment growth on the economic growth.

For Bangladesh economy, investment and per capita income growth have been widely used in many empirical researches. It has been found that the investment is studied over economic growth whereas per capita income is subjected with many variables like FDI, trade, money supply, good governance etc. For example, Uddin and Aziz (2014) have examined the effects of public investment on economic growth in Bangladesh during the

time period of 1973 to 2011 and found positive impacts of public investment on economic growth. Hussain and Haque (2016) have used Vector Error Correction Model (VECM) to show the relationship between Foreign Direct Investment (FDI), trade and growth rate of per capita GDP in Bangladesh for the time period of 1973 to 2014. They found significant effects of FDI and trade on growth rate of per capita GDP in Bangladesh.

2.2. Inflation and Per Capita Income Relationship

Alshamsi et al (2017) have investigated the impact of inflation rate and per capita GDP on FDI inflow for United Arab Emirates for the period of 1908 to 2013. They concluded that inflation has no significant impact on FDI and they also found a positive impact of per capita GDP on FDI in United Arab Emirates. Cooray (2013) estimated that up to 11% of inflation rate, growth has positive relationship with inflation after that level growth drops down if inflation continues to increase in Sri-Lanka. Chisty et al (2015) have investigated the impact of inflation on per capita income in BRICS countries. In their analysis,they found that inflation do not statistically influence the per capita income in the three countries like India, Brazil and South Africa, on the other hand, inflation do statistically influence per capita income for other two countries which are China and Russia. Another study conducted by Ilyas et al (2014) has found that inflation and real interest rate are negatively related with economic growth in Pakistan

However, in Bangladesh, most of the empirical research subjected inflation in relation with economic growth rather than per capita GDP. For example, Hossain, et al. (2012) have explored the long run relationship of inflation and economic growth in Bangladesh. They used VAR Granger causality method and found uni directional causality from inflation to economic growth. In a similar investigation, Majumder (2016) used Vector Error Correction Model (VECM) and found a positive correlation between inflation and economic growth in Bangladesh in the long run. Javed, et al (2015) have analyzed the comparisons of standard of living between Pakistan and Bangladesh with respect to some social and economic factors. Amongst many relationships, they, however, found that price level in the both the countries are negatively related with per capita income. Kamal (2016) has investigated long run causality between money income and price level in Bangladesh. By using time series econometric techniques, he found uni directional causality running from price to real GDP in Bangladesh.

2.3. Debt, Investment and Per Capita Income Relationship

Smrcka and Arltova (2014) have examined the effects of public sector debt on the people's standard of living in Czech Republic. In the case of subsidized sovereign debt, they noted that a part of debt did not raise the family income rather have been used for imports of goods and services. Jadoon, et al (2014), have studied the impacts of foreign debt service payment on the per capita income growth rate of Pakistan both in short-run and long run. They found that excessive debt service payment as a result of mounting debt sock has negative effect to the per capita income growth rate. In the similar investigation, Jacobo and Jalile (2017) have found highly statistically significant non-linear relationship between government debt and per capita GDP in 16 Latin American economies. Saad (2012) has explored the empirical relationship between external debt, export and economic growth for Lebanon over the time period 1970 to 2010. He employed vector error correction model and Granger causality test and found bi directional causal effects between external debt and economic growth.

Yesmin, et al (2016) found significant negative impact of debt on GDP growth rate in Bangladesh. They concluded that debt is a burden as it is not creating income generating activities in the country and hence is making GDP growth slowed down. On the other hand, Rahman, et al (2012) also identified positive impact of debt on the economic performance of Bangladesh. Islam and Faisal (2012) analyzed the sustainability of debt in Bangladesh and it future impact to the economy. They concluded that external debt costs heavily to Bangladesh people. They have expressed their concern in the paper as Bangladesh spends significant portion as debt service payment each year which ultimately hampering the health and education sector in particular.

3. Theoretical Framework

The role of investment in the process of economic development is significant in all the prominent growth theories like classical, neo classical and Keynesian theories of economic development. The classical growth theories developed by Adam Smith stressed on the investment which is determined by the increase in capital endowment per worker (k) and fraction of savings (s) for the higher economic growth. In the Ricardian doctrine, profit finances investment and the growth rate of capital stock determines the growth rate of national product (Chang, 2010).

According to the Keynesian growth theory, investment is inevitable to bring the additional effective demand through the multiplier mechanism (Chang, 2010, p. 18). The

model explains the significance of investment on income and output growth by the name of income effect of investment and capacity effect of investment. The income effect of investment tells that more investment brings more income and profit whereas the capacity effect of investment explains that the higher output growth mainly depends on capital productivity and investment volume.

However, the paper also uses the concept of debt overhang theory developed by Myers (1977), Krugman (1988) and Cohen (1993).The theory explains the relationship of debt and income generation through the acceleration of investment growth. As stated by the theory, the debt should be transformed into productive investment which would increase income for the mass by creating employment opportunities and would be helpful for the debt retirement.

Hence, in accordance with the theoretical aspects, as stated above, investment is important for the acceleration of income growth. However, if debt is not utilized properly, as the debt overhang theory says, it will impact negatively on investment and thereby on the income generating activities. In this backdrop, the paper intends to examine the impact of investment, debt and inflation on the per capita income in Bangladesh.

4. Data and Methodology

4. 1. Data

The study is based on secondary data. The data of the study variables such as the Per Capita Income (PCI), Total Investment and Consumer Price Index (CPI) have been collected from World Economic Outlook (2019) and the data of Total Debt (TD) is taken from Ministry of Finance of Bangladesh and World Economic Outlook (2019). However, the data of inflation has proxied by data of Consumer Price Index (CPI). To investigate the relationship between the study variables, the paper uses time series data for the time period 1980 to 2018.

Table-1: Trends of Total Investment (TI), Per capita Income (PCI), Consumer Price Index (CPI) and Total Debt (TD) in Bangladesh

Year	TI (Percentage of GDP)	PCI (In US $)	CPI	TD (Percentage of GDP)
1980	13.34	-1.853	17.92	32.50
1985	17.38	262.55	27.8	37.02
1990	17.51	329.49	49.85	40.11
1995	20.44	383.10	63.73	51.80
2000	24.151	412.334	80.224	50.12
2005	26.063	495.486	102.691	42.296
2010	26.874	807.531	163.519	35.489
2015	29.295	1303.18	227.388	33.68
2018	31.599	1744.51	268.082	34.759

Source: 1) World Economic outlook (2019)

2) Bangladesh Economy: Recent Macroeconomic Trend, Ministry of Finance

4.2: Model Specification

4.2.1 Co Integration Test: Johansen Juselius Co Integrating Method.

Co integration among the time series variables refers to the existence of stable long run relationship. A number of econometric methodologies like two-step procedure of Engel and Granger (1987), Johansen Juselius Co integration technique are being widely used to empirically analyze the time series variables. However, in this study, the method developed by Johansen (1988, 1991) and Johansen and Juselius (1990) is applied to detect the number of co integrating vectors as the time series is large and also are integrated at same order. However, the following equation is estimated under the Johansen Co integration framework.

$$\Delta X_t = \mu + \Gamma\Delta X_{t-1} + \ldots\ldots\ldots\ldots \Gamma_{k-1}\,\Gamma\Delta X_{t-k+1} + \Pi\, X_{t-1} + \nu_t \qquad (1)$$

Where, Δ is the difference operator, X is the vector of variables, μ is a draft parameter and $\Gamma_1 + \ldots\ldots\ldots\ldots \Gamma_{k-1}$ is the coefficient matrices. Moreover, according to the Johansen Juselius co integrating method, there are two test statistics like trace statistics and maximum eigen value test statistics to find the number of co integrating vectors.

$$\lambda_{trace} = T \sum_{i=r+1}^{N} ln(1-\lambda_i) \qquad (2)$$

$$\lambda_{max)} = - T \ln (1-\lambda_{r+1}) \qquad (3)$$

Here, T is the sample size and λ_i is the N-r smallest canonical association. The Trace and maximum Eigen value statistics test the null hypothesis that the number of co integrating vectors r against the alternative co integrating vectors r+1 respectively. In both tests, the rejection of null hypothesis (r=0) and acceptance of alternative hypothesis indicates that the time series are co integrated.

4.2.2: Toda-Yamamoto Augmented Granger Causality Test

In this paper, the Toda-Yamamoto augmented Granger causality test has been applied to determine the direction of causality among variables. The paper uses this method because it has some specific advantages regarding the pretesting of stationary and co integration test. The formulation of Toda-Yamamoto approach is basically based on the augmentation of VAR order k with d_{max}, where d_{max} is the maximum order of integration. The model can be specified as follows:

$$LNPCI_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{2j} LNPCI_{t--j} + \sum_{i=1}^{k} \beta_{3i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{4j} LNTI_{t-j} + \sum_{i=1}^{k} \beta_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \beta_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{8j} LNTD_{t-j} + \varepsilon_{1t} \quad (4)$$

$$LNTI_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{2j} LNTI_{t--j} + \sum_{i=1}^{k} \alpha_{3i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{4j} LNPCI_{t-j} + \sum_{i=1}^{k} \alpha_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \alpha_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{8j} LNTD_{t-j} + \varepsilon_{2t} \quad (5)$$

$$LNCPI_t = \lambda_0 + \sum_{i=1}^{k} \lambda_{1i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{2j} LNCPI_{t--j} + \sum_{i=1}^{k} \lambda_{3i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{4j} LNTI_{t-j} + \sum_{i=1}^{k} \lambda_{5i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{6j} LNPCI_{t--j} + \sum_{i=1}^{k} \lambda_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{8j} LNTD_{t-j} + \varepsilon_{3t} \quad (6)$$

$$LNTD_t = \Psi_0 + \sum_{i=1}^{k} \Psi_{1i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{2j} LNTD_{t--j} + \sum_{i=1}^{k} \Psi_{3i} LNTI_t + \sum_{j=k+1}^{k+dmax} \Psi_{4j} LNTI_{tj} + \sum_{i=1}^{k} \Psi_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \Psi_{7i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{8j} LNPCI_{t-j} + \varepsilon_{4t} \quad (7)$$

Where, PCI is Per Capita Income, TI indicates the total investment as a percentage of GDP, CPI is inflation and TD is Total Debt as a percentage of GDP. In the equations, β_i's, β_j's, α_i's , α_j's, λ_i's, λ_j's and Ψ_i's, Ψ_j's are the parameters to be estimated and ε_{1t} , ε_{2t}, $\varepsilon_{3t,}$ ε_{4t} are the white noise error terms.

In this method, the results can be specified in the following manner. For example, in equation 4, LN PCI is dependent variable whereas LN TI, LN TD and LN CPI are

independent variables. This equation measures the impact of total investment (LNTI), total debt (LN TD) and inflation rate (LN CPI) on the per capita income (LN PCI). Now, the null hypothesis can be set as:$\beta_{3i}= \beta_{5i} = \beta_{7i} = 0$. if $\beta_{3i} =0$ is rejected, it indicates that total investment causes per capita income. In the same vein, the rejection of $\beta_{5i} = \beta_{7i} = 0$ would imply that changes in inflation and total debt would cause per capita income and vice versa. The test of hypothesis is done by Wald test where the Wald statistics has asymptotic chi-square distribution with k degrees of freedom.

5. Empirical Results

As mentioned above, the estimation of Johansen Juselius co integration test can accommodate variables which are non stationary at level and are integrated at same order. Hence, unit root test is necessary to check the order of integration of the time series. Furthermore, according to the Ajayi and Aluko (2016), the unit root test would provide the maximum order of integration d_{max} which is necessary to run the Toda-Yamamoto augmented Granger causality test. The Augmented Dickey Fuller test (1979) has been employed to find the maximum order of integration of the variables. The optimal lag length has been determined by the Schwartz Information Criteria (SIC) and also by using trial and error method. The results of the ADF test are presented in table II

Table – II

Unit root test (ADF) for the time period of 1980 to 2018

Intercept				
Series at Level			First Difference	
Variables	Test Statistic	Probability	Test Statistics	Probability
Ln pci	-0.611638 (1) **	0.8539	-17.41622 (0) **	0.0001
Ln ti	-0.274412 (3) **	0.9188	-16.45138(0) **	0.0000
Ln cpi	-1.514038 (1)	0.5155	-10.40817 (0) **	0.0000
LnTd	-1.603491(0)	0.4711	-5.060122(0)	0.0002

With Trend and Intercept

	Series at Level		First Difference	
Variables	Test Statistic	Probability	Test Statistics	Probability
Ln pci	-2.884712 (3)**	0.1825	-16.97372(0) **	0.0000
Ln ti	-1.589713 (2)**	0.7773	-4.819371(1) **	0.0022
Ln cpi	-3.008253 (2)**	0.1440	-10.26979 (0) **	0.0000
Lntd	-1.968279 (0)	0.5994	-4.489215(3)	0.0056

Note: i) ** indicates significance at the 5% level.

ii) Figures in the parentheses represent the optimal lag length

According to the results depicted in table-II, the time series are non stationary at level and stationary at first difference for both intercept and with trend and intercept. That is, all the variables are integrated of order 1, I (1). These results allow the conduct of Johansen Juselius co integration technique and also provide maximum order of integration for Toda-Yamamoto Granger non-causality test.

TABLE –III

JOHANSEN JUSELIUS TEST OF COINTEGRATION

Data Vector	Null Hypothesis	λ Trace	Probability	λ Max	Probability
	None	327.9610**	0.0001	267.1897**	0.0001
LN PCI, LN TI	At most 1	60.77135	0.0000	36.92232	0.0042
LN CPI, LN TD	At most 2	23.84903	0.0022	22.04121	0.0024
	At most 3	1.807821	0.1788	1.807821	0.1788

Note- i): Test assumption includes linear deterministic trend in the series

ii): Optimal lag is 5 determined by Schwartz Information Criteria (SIC)

ii): ** indicates significant at the 5% level

The Johansen Juselius test of co integration approach has been applied to find the long run relationship among the variables. The result evident in table III suggests that there exist three co integrating vectors as both the trace and Eigen value statistics are less than 5% critical value at rank 3. This indicates that the variables are co integrated and have long run stable relationship.

Table IV

Toda-Yamamoto Augmented Granger Causality test

Null Hypothesis	Value of Chi Square	Probability	Inference
TI does not Granger cause PCI	1.030550	0.9051	Does not reject H_0
CPI does not Granger cause PCI	2427959	0.6576	Does not Reject H_0
TD does not Granger cause PCI	4.956584	0.2918	Does not reject H_0
PCI does not Granger cause TI	6.222251	0.1832	Does not reject H_0
CPI does not Granger cause TI	3.390769	0.4947	Does not reject H_0
TD does not Granger cause TI	5.113113	0.2759	Does not reject H_0
PCI does not Granger cause CPI	2.130789	0.71117	Does not reject H_0
TI does not Granger cause CPI	0.573579	0.9660	Does not reject H_0
TD does not Granger cause CPI	0.865030	0.9295	Does not reject H_0
PCI does not Granger cause TD	23.94546	0.0001	Reject H_0
TI does not Granger cause TD	18.01158	0.0012	Reject H_0
CPI does not Granger cause TD	45.73986	0.0000	Reject H_0

Table IV reports the results of Toda-Yamamoto augmented Granger causality test. The results as stated in table IV do not necessarily depict the investment led income growth in Bangladesh as the result found no causal relationship between total investment and per capita income in Bangladesh. The total debt, as it is mentioned earlier that should have the significant contribution in accelerating investment growth, however, the causality results evident that the total debt does not cause investment growth and thereby has found no positive impact on per capita income growth in Bangladesh. Furthermore, as the result depict, CPI has also found no causal effect on the per capita income in Bangladesh.

6. Conclusion and Policy Recommendation

The main objective of this paper was to empirically examine the effects of total investment on the per capita income of Bangladesh. The paper intends to investigate their relationship because compare to the rising trend of per capita income, the investment performance does not show any encouraging trend. Furthermore, the paper has also incorporated total debt and inflation as explanatory variables. Theoretically, if debt and inflation do not cause investment, it would indicate that the acceleration of total debt and stability in the inflation will not necessarily increase per capita income in the long run.

The long run linear relationship between the variables is confirmed by Johansen Juselius co integration approach while causal effects are tested by the Toda-Yamamoto Granger causality test. The empirical results suggest that total investment does not cause per capita income in Bangladesh. The result has also confirmed that total debt does not cause investment and thereby found no positive impact of total debt on per capita income. Nevertheless, as the results suggest, inflation has found no causality to investment and to per capita income.

However, the findings stated above have some serous policy implications for the government. In this study, the work has found no evidence of investment led income growth in Bangladesh. Moreover, no causality between debt and investment indicate poor performance of production oriented investment growth in Bangladesh. Hence, through this, the paper suggest government to put serious look on proper utilization of overwhelming debt and urges for implementing more investment oriented economic policy in Bangladesh.

References

1. Abulrahman, Dr. B. M. A. (2015),” Investment and Economic Growth in Sudan: An Empirical Investigation” International Journal of Technical Research and Applications, Vol 3, Issue 2, pp. 93-96.
2. Adetiloye, K. A. and Adeyemo, K. A. (2012), “Domestic Investment, Capital Formation and population Growth in Nigeria” Development country studies, Vol 2, No 7. PP. 37 -4.
3. Alshamsi, K H., Husin, M. R.b. and Azam, M. (2015),“The Impact of Inflation and GDP per Capita on Foreign Direct Investment: The Case of United Arab Emirates”, International Management and Financial Innovations, Vol 12, Issue 3, 132-141.
4. Bangladesh Economy: Recent Macroeconomic Trend, Ministry of Finance, Government of the People’s Republic of Bangladesh, available: https://mof.portal.gov.bd/site/page/0a064da3-b9bb-4ce5-95e2-f8c9fb8bd3da, accessed: December 17, 2017.
5. Chang,J.(2010), “Some Theoretical and Empirical Aspects of the Process of Economic Development in China since the Reforms of Deng Xiaoping” A thesis accepted by Faculty of Economics and Social Sciences, University of Fribourg, Swizerland, 1-36.Retrieved from: https://doc.rero.ch/record/20303/files/ChangJ.pd
6. Churchill, S. A., Yew, S. L. and Ugur, M. (2015), “Does government size affect per capita income growth? A hierarchical meta- regression analysis” Discussion paper 37/15, Monash Business School, pp, 1-32.
7. Chisty, K. A, Ali, K. and Sangmi, M. (2015),”Impact of Inflation on per Capita Income in Emerging Economies: Evidence from BRICS Nations” Journal of Empirical Studies, 2(2), 34-39.
8. Cooray, N. S, (2013), “An Empirical Analysis of Inflation – Growth Nexus in Developing Countries: The Case of Sri-lanka” Economics and Management Series, International University of Japan, 1-19. Retrieved from: https://iuj.repo.nii.ac.jp/?action=repository_uri&item_id=506&file_id=22...
9. Cohen, D. (1993), "Low investment and Large LDC Debt in the 1980's," The American Economic Review, vol. 83 no. 3, pp. 437-449.
10. Engle, R. F., and Granger, C. W. J. (1987). “Cointegration and Error-Correction: Representation, Estimation and Testing”, *Econometrica, vol.* 55, no. 2, pp. 251-256
11. Fagbohun, A. andAdekoy ,O.M. (2016), “Investment as a determinant of Per capita income Growth in Nigeria: An Empirical Analysis” European Journal of Business and Management, Vol.8, No.11. pp. 175-181
12. Hasan, S. and Murtala, M. (2016), “The Role of Domestic Private Investment in Promoting Per Capita Income Convergence amongst Association of Southeast Asian Nations-5 Economies”, International Journal of Economics and Financial Issues,6(9), 1299-1303.

13. Hossain, D.M.E., Ghosh,B. C. and Islam, M. K. (2012), "Inflation and Economic Growth in Bangladesh" Journal of Arts,Science and Commerce, Vol. III, Issue 4(2), pp. 85-92.

14. Hussain, M. E. and Haque, M. (2016), "Foreign Direct Investment, Trade and Economic Growth: An Empirical Analysis of Bangladesh" Economies, Vol 4, No 7. 1-14.

15. Ilyas, M, Sabir, H. M., Shehzadi, A. and Shoukat, N. (2014)," Inter-relationship among Economic Growth, Savings and Inflation in Pakistan" Journal of Finance and Economics, Vol 2, No 4, 125-130.

16. Islam, A. And Faisal, F. (2012), "External Debt of Bangladesh: Sustainability and Future Concern", Finance and Management, 49(2012), pp.9893-9897.

17. Javed, M. R., Amin, A. and Azim, P. (2015), "Comparison of Standard of Living between Pakistan and Bangladesh", International Journal of Asian Social Science, 5(12), 715-724.

18. Jadoon, A. K., Batool, S. A. andMahmood, T. (2014), "Finding the Impact of Foreign Debt Servicing on Per Capita Income Growth Rate: A Case Study of Pakistan", African Journal of Marketing Management, 6(4), 39-48.

19. Jacobo,A. D. andJalile, I. R.(2017), "The Impact of Government Debt on Economic Growth: An Overview for Latin America", Working Paper Series No.28, Department of Economics , University of Perugia, Retrieved from; www.econ.unipg.it/files/generale/wp_2017/wp_28_2017_jacobo_jalile.pdf

20. Kamal, K.M. M. (2016), Investigating Long run Relationship Between Money Income and Price for Bangladesh:Application for Econometrics and Cross Spectra Methods." Journal of Science Foundation, Vol 14, No 1, pp. 17-25.

21. Krugman, P. (1988), "Financing vs. Forgiving a debt overhang," *Journal of Development Economics*, Vol. 29, issue, 1988, pp. 253-268.

22. Majumder, S. C. (2016), "Inflation and its impacts on Economic Growth in Bangladesh" American Journal of Marketing Research, Vol 2, No 1, pp. 17-26.

23. Makuyana, G. and Odhiambo, N. M (2016), "Public and Private Investment and Economic Growth: A Review" Journal of Accounting and Management, Vol 6, No 2, pp. 25-42.

24. Myers, S. C. (1977), "Determinants of corporate borrowing," Journal of Financial Economics, no. 5, issue, 2,pp. 147-175.

25. Rahman, M. M,. Bashar, M. A. And Dey, S. (2012), "External debt and Gross Domestic Product in Bangladesh; A Co-Integration Analysis" Management Research and Practice, Vol 4, Issue 4, pp.28-36

26. Raihan, S. (2016), "Is Bangladesh all set to be a Middle Income Country" Daily Star, March 6, 2016. Retrieved from: http://www.thedailystar.net/op-ed/bangladesh-all-set-be-middle-income-country-786709.

27. Saad, W. (2012), “Causality between Economic Growth, Export and External Debt servicing: The Case of Lebanon” International Journal of Economics and Finance, Vol 4, No 11, pp.134-143.

28. Smrcka, L. and Arltova, M. (2014), “Debt in Relationto to the Standard of Living Enjoyed by the Population of Developed Countries”Prague Economic Papers, Vol. 2014, Issue, 1, 84-107.

29. Toda, H.Y. anf Yamamoto (1995) “ Statistical Inference in Vector Autoregressive with Possibly Integrated Process”, Journal of Ecoometrics, Vol: 66, pp. 225-250

30. Yesmin, F,. Chowdhury, M. N. M. And Hossain, Dr. M. A. (2015), “External public Debt and Economic Growth in Bangladesh: A Co-Integration Analysis” International journal of Economics and Sustainable Development, Vol 6, No, 23, pp. 64-74.

31. World Economic Outlook (2019), International Monetary Fund (IMF), Washington D.C.

Comparative Advantage and Export Potential for Bangladesh in the World, the EU-West Europe, and the USA Markets: An Empirical Analysis

Rashedul Kabir[1]
Ayub Ali[2]
Samim Uddin[3]

Abstract:

This paper investigates comparative advantage and the export potential for the major competing countries i.e. India, Sri Lanka, Vietnam, Pakistan, China, Cambodia and Turkey along with export potential sectors and products of Bangladesh. The Revealed Comparative Advantage analyzes the extent of comparative advantage between Bangladesh and its major competitors. The Export Potential Assessment identifies the export potential from Bangladesh to the world market. Apparel sector has the highest export potential sector in value terms. Currently, Bangladesh economy has focused on the large apparel sector that accounts for 80-90 percent of its export baskets. Most of the sectors and product potentials have already been utilized, especially in the EU–West Europe (Bangladesh's export share 56 percent) and the USA (Bangladesh's export share 17 percent) markets. The findings are expected to contribute to extract untapped export potential that may help to take next step by increasing the export volume to the respective potential markets as well as products.

Keywords: Revealed Comparative Advantage (RCA), Export Potential Assessment (EPA), Apparel, EU-West Europe, USA

JEL Classification: C43, E00, F10, F14, F17

---

[1] Senior Assistant Secretary, Research & Development Cell, Bangladesh Knitwear Manufacturers Exporters Association-BKMEA, Dhaka, Bangladesh

[2] Senior Assistant Secretary, Research & Development Cell, Bangladesh Knitwear Manufacturers Exporters Association-BKMEA, Dhaka, Bangladesh

[3] Assistant Director (Research), Bangladesh Bank, Dhaka, Bangladesh

1. Introduction

Bangladesh is the second largest exporter to both the USA and EU–West Europe markets facilitated by generalized system of preferences (GSP), which provides opportunities for many developing and underdeveloped countries to use trade privileges such as zero tariffs to grow their economies and get escape from poverty. Export potential is determined for sectors and products as additional export earnings and the changing value and structure of export products in particular sector, in which Bangladesh export basket is filled with only apparel products accounting for nearly 83.5 percent of the total export earnings (BKMEA, 2018). According to the Annual Report of Bangladesh Bank in the FY18, the macroeconomic situation in Bangladesh has been quite stable for recent few years. Export earnings from both the apparel and remittance inflows help to achieve the solid economic growth, where share of the apparel sector alone about 14.09 percent in GDP. In FY18, total export earnings from the apparel sector was USD 30.61 billion, which was 8.76 percent higher than the previous year (EPB, 2018). At present, there are about 5000 apparel factories running in full production in the country (BKMEA, 2018). The apparel sector plays a key role in employment generation and income earning particularly for the poor and female. Approximately 4.1 million workers directly and more than 15 million inhabitants are indirectly associated with the apparel sector in Bangladesh (BKMEA, 2018). Apparel is a manufacturing industry. Bangladesh is the second largest apparel producer in the world (Textile Today, 2018). Bangladesh enjoys price competitiveness due to cheaper labour supply; the foremost emphasis has been given by the successive governments to the development of this sector for reaping the benefits of the abundant availability of its cheaper labour force. Unfortunately, Bangladesh is facing threats from the major competitors of apparel exports in the world market, particularly from China, India, Pakistan, Sri Lanka, Vietnam and Cambodia.

Comparative advantage and Export Potential Assessment (EPA) can favor a country or a group of countries or regional bloc to scrutinize benefits from international trade. The Revealed Comparative Advantage (RCA) is one of the most effective techniques to assess comparative advantage by any product, sector, country, or region in the world market. Liesner (1958) first introduced the concept of RCA, which is to assess how competitive the country is in exporting a certain product as compared to the world. Later, Balassa (1965) developed it further. Balassa (1965; 1971; 1977) published and finally analyzed RCA technique for manufacturing sectors and across industries. Comparative

advantage in trade increases the efficiency of using scarce resources and promotes higher economic welfare. RCA measurement can efficiently be used to determine comparative advantage in trade such as patterns of trade specialization, trade patterns and international trade advantage. The Heckscher–Ohlin theory states that comparative advantage of a country depends on relative factor endowment across nations and trade affects relative factor prices within and across nations.

This paper analyzes comparative advantage and export potential assessment of the major export potential sectors of the country as well as the potential apparel products by using the RCA Balassa Index (1965), and Export Potential Indicators (EPI) at Harmonized System (HS) 6–digit level. It aims to identify a relative position of exporting sectors and products, especially apparel products of Bangladesh in the world market, the EU-West Europe and the USA as well as to explore the export potentiality in the respective markets with major competitors.

2. Objective of the Paper

The goal of this paper is to analyze the export potential and comparative advantage of Bangladesh in the world, the EU-West Europe and the USA markets. With this objective in mind the paper attempts to verify the EPA and the RCA status to understand assess the export potential and comparative advantage of Bangladesh with regards to the aforesaid three markets.

Specific Objectives: To achieve this goal, the following specific objectives are identified for this paper:

a) To find out the major export potential sectors and products of Bangladesh in the world market as well as in the EU and the USA markets.
b) To examine the comparative advantage of the major export potential products of Bangladesh with its major exporting competitors.

3. Literature Review

The RCA index is an important investigative instrument for comparative advantage over time. It provides information on the top competitor countries on trade movement in comparative advantage term over a given period. Many studies are found to use the concept of RCA by using export data. Balassa (1977) examined the pattern of comparative advantage for various countries for the period from 1953 to 1971. The

evidence supported that research-intensive products, keep product cycle continue when those are traded. This paper also measured the standard deviation of RCA indices to see the correlations between size and exports diversification for various countries. Yeats (1992) examined the trade pattern and concluded that distortion in trade patterns due to inequitable trade barriers were features of RTAs.

Ahmad (2013) estimated RCA of textile and clothing sectors of Pakistan. It revealed that Pakistan has a comparative advantage in the textile sector, but the low comparative advantage in the clothing sector. The paper also analyzed RCA of textile and clothing (Textile is a fabric that is knitted or woven and made from yarn. Clothing is the readymade garment that is made from the textile products) sectors during (1995 to 2005) the period of pre and post quota imposition by importing countries. Shohibul (2013) investigated the comparative advantage for the ASEAN countries and China by using a Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI) approach. Export products are analyzed based on Standard International Trade Classification (SITC) revision-3. The paper disclosed that the China has more established patterns of trade, while ASEAN trade patterns are dynamic.

Bastos and Cabral (2007) tested the dynamics of international trade patterns in 20 OECD countries over the period covering 1980 to 2000. They observed the changes in trade patterns explained by an initial endowment of human capital and industry-specific changes in labour productivity and labour cost. Trade liberalization induced an increase in the previous specialization of larger OECD economies in industries with increasing the return to scale. Similarly, Hadzhiev (2014) measured overall RCA for all goods or Euclidean distance by specialization in export. The approach provides empirical evidence for the theoretically proven scale and scope effect in the area of trade and specialization of exports. The paper also explained that the overall revealed comparative advantages approach is a useful tool for the analysis of export specialization in modern international trade.

Lalit (2013) calculated RCA of export performance of clothing sector for India and Bangladesh. The paper used the Harmonized System (HS up to 4–digit level) to analyze competitive advantage of various clothing products for the period of 1995 to 2003 for both countries. Furthermore, it revealed that comparative advantage in clothing products of India increased from 23 products to 25 products and comparative advantage of the same products of Bangladesh increased from 21 to products to 29 products in this period.

Spies, Y.D. (2016) investigated the Export Potential Assessments (EPA) Methodology to identify export opportunities for developing countries. International Trade Centre (ITC) has developed an export potential assessment methodology. It is based on a decomposition of a country's potential exports of a product to a given target market into three factors: supply, demand and easiness to trade. Depending on the country's particular needs, two approaches are available: (i) the export potential indicator (EPI) and (ii) the product diversification indicator (PDI). Hence, the export potential indicator (EPI) has applied to identify the export potential of sectors and products.

International Trade Centre (ITC, n.d), examines export potentials of Ethiopia, Kenya, Mozambique and Zambia by the Partnership for Investment and Growth in Africa. The categorization of products with potential and for diversification has depended on ITC's export potential assessment methodology. All export potential calculations in this paper are done at a fine level of product aggregation, based on the six-digit level of the Harmonized System (HS) classification. Ethiopia has strong capacities to export agro-based products and Kenya's export opportunities are spread across the entire agricultural and manufacturing value chains. While aluminum and other minerals dominate total exports, Mozambique also has a sound agricultural base. Zambia's economy is strongly focused on copper, which represents a high share of total exports. Diversification is, thus, a priority for the country.

International Trade Centre (ITC, 2015) provided regional analysis, country and sector fact sheets to assess the existing export potential and diversification opportunities of 64 developing countries in European, emerging and regional markets. ITC has applied and customized its methodology to support the Centre for the Promotion of Imports from developing countries (CPI) in its selection of value chains with the aim of achieving better targeted and more effective interventions.

International Trade Centre (ITC, 2015) analyzed trade growth opportunities for sub-Saharan Africa (SSA) through market diversification and lowering its dependency on the export of commodities – describes general trade trends between sub-Saharan Africa and other emerging markets, for example in Asia; presents an assessment of value chain integration for the African economy overall and for individual countries and sectors; identifies sectors and regions with a large potential for trade; assesses the magnitude of potential trade and the economic benefits to SSA from various trade-related strategies and

policies; shows the extent to which trade could be further enhanced by halving transport time and costs and facilitating trade within Africa as well as between Africa and Asia.

4. Methodology and Data Sources

The classification of sectors and products *(appendix: A)* with comparative advantage and export potential assessment explore the opportunities of exporting products in the target country. This paper has been planned to complete by the two prominent methods. Hence, firstly the paper has used the Revealed Comparative Advantage (RCA) to show the comparative advantage using the Balassa Index. Secondly, it has used Export Potential Assessment (EPA) technique to analyze the export potential of Bangladesh. It is applied to identify, Bangladesh, high potential export products in the world market, as well as in the EU & West Europe (*Appendix: D*), and the USA. For this purpose, the data have been collected from various sources (Appendix: B), specially from International Trade Centre (ITC) Map, Geneva for variables of RCA index and EPA analysis. RCA index and EPA indicator are two standard approaches to calculate a country's comparative advantage and export potential assessment in the sectors and products.

4.1 Methods

It is assumed that the two decisions are made separately in two stages. Firstly, the RCA index has been applied to address the comparative advantage of the major competitor countries of Bangladesh. The following formula is used based on the Balassa Index:

$$RCA = \frac{\frac{x_{ij}}{x_i}}{\frac{x_{wj}}{x_{sw}}}$$

Where,

X_{ij} : ith the country's export of commodity j to the world market.

X_i : ith the country's total export to the world markets

X_{wj} : The major competing countries' exports of commodity j to the world markets

X_w : The major competing countries' total exports to the world markets

According to the value of this index, if RCA > 1, then a country has a comparative advantage; and if RCA < 1, then a country has a comparative disadvantage in that commodity or industry.

Secondly, the Export Potential Assessment (EPA) has also been used as a technique to analyze the export potential using the export potential indicators. Export potential assessments consist of two indicators. Hence, Export Potential Indicators (EPI) have

presented export potential values of existing export sectors and products in a given target market.

The function is used to estimate export potential at the sectors and products level in a given target market.

$\upsilon_{ijk} = \alpha_{ik}\beta_{ij}\gamma_{ik}$……………………………………………………………………………(1)

where, υ_{ijk} = corresponds to exports from exporters i of product k to market j. The parameter α_{ik} describes exporter i's performance in exporting product k, γ_{ik} markets reflects j's demand for products k and β_{ij} the easiness to export any goods from i to j.

Supply Side:

This equation describes the supply side performance [17].

Supply $^{EP}_{ik}$ = Projected $MS_{ik} \times TB_{ik} \times GTA_{ik}$ …………………………………….. (2)

Where, Projected MS_{ik} = the exporter's capacity to export (ΔGDP_i is the ratio of expected over current GDP for country i). TB_{ik}= export – import ratio and GTA_{ik}= Global margin of preference.

Demand Side:

The demand equation focuses on the accounting for the openness of the target market to the products exported by the country [17].

$Demand_{ijk} = ProjectedM_{ijk} \times MTA_{jk} \times Distancefactor_{ijk}$………………………(3)

Where, $ProjectedM_{ijk}$ = Projected Import; MTA_{jk}= Margin of Preference in target market and Distance $factor_{ijk}$= Distance Advantage

Easiness to trade:

The easiness to trade equation is

$$Easiness\ ij = \frac{\upsilon ij}{\sum k(\text{Supply}\ ^{EP,static}_{ik} \times \text{Demand}\ ^{static}_{ijk})} \text{ …………………………………. (4)}$$

The final equation is derived from equation (2), (3) and (4) that value follows directly from the combination of supply, demand and easiness to trade factors:

EP $_{ijk}$= Supply $^{EP}_{ik}$ ×Easiness $_{ij}$× Demand $_{ijk}$…………………………………………(5)

A normalization similar to the one presented in equation (3), ensures that summation over i results in EP $_{jk}$= Projected $_{jk}$. The comparison of potential exports values with actual export values allows revealing untapped opportunities that trade support institutions can address.

5. Results and Discussion

This section shows the categorization of the major export potential sectors and products of Bangladesh and its major competitors at the HS 6-digit level. This section also highlights the comparative advantage on the basis a measure of the export volume. Apparel is the greatest export potential sector of Bangladesh in which the country has a comparative advantage. Hence, this paper tries to measure and assess the comparative advantage of the major export potential apparel products of Bangladesh to explore its trade potential in this sector.

5.1 *Top 10 Bangladeshi Apparel Export Items*

The analysis has focused on the major export potential apparel products of Bangladesh by using an explanation of RCA analysis and the export potential assessment (EPA) technique as an export potential indicator, as well as major countries' RCA explains aligned with Bangladeshi's major export potential products. This RCA index is provided for eight countries in 2016 at HS 6-digit level (Appendix: C). Table 1 below reports a brief summary of the products:

Table 1. **Major Export Potential Exporting Products of Bangladesh**

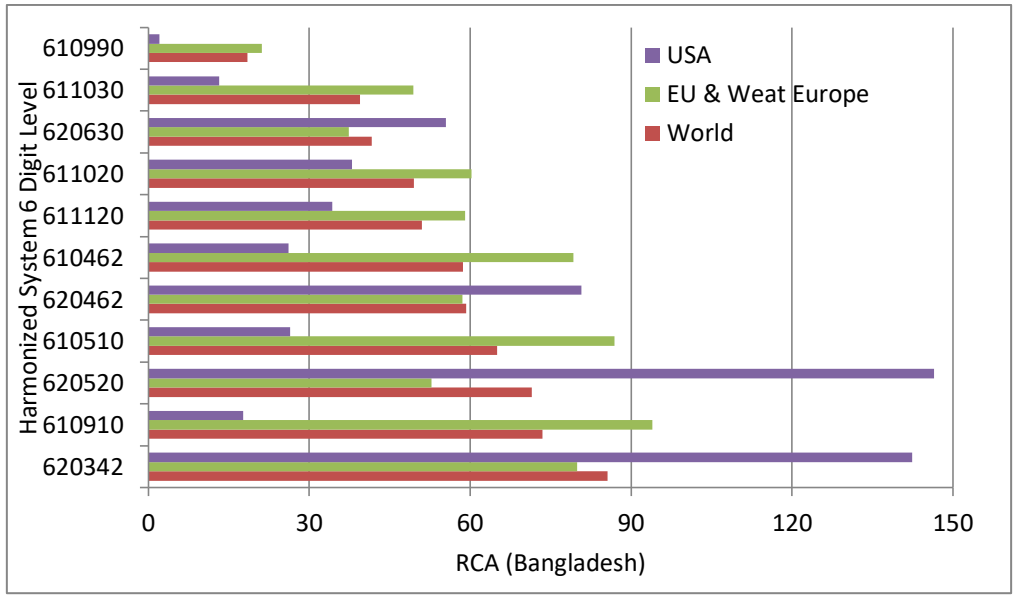
HS-Code	Product-label
620342	Men's or boys' trousers
610510	Men's or boys' shirts of cotton, knitted
610910	T-shirts, cotton
610990	T-shirts, textile materials
611020	Jerseys, pullovers, cardigans, waistcoats, cotton
611030	Jerseys, pullovers, cardigans, waistcoats, man-made fibres
611120	Babies' garments
620342	Men's trousers & shorts of cotton
610462	Women's or girls' trousers, knitted
620520	Men's or boys' shirts of cotton
620630	Women's blouses & shirts of cotton

Source: Ranking of ITC Export Potential Map, 2018

5.2 Comparative Advantage of Bangladesh in the Major Destination Market:

Bangladesh is the most competitive country in the world market as well as the EU-West Europe and the USA markets. The finding has revealed a comparative advantage in the major export potential apparel products (11 products). This signifies that Bangladesh is specialized in the production of such products in those markets. The results reported in Figure (1) below shows that Bangladesh's average comparative advantage is the highest in the EU-West Europe markets than the USA and rest of the world markets.This means that RCA of the three markets (the world market, the EU-West Europe market and the USA market) is showing an overall comparative advantage for Bangladeshi products to these markets. It also identifies that the RCA of the two products (620520) and (620342) from Bangladesh are the highest in the USA market.

Figure 1: **Bangladesh RCA Scenario of the Major Products**



5.3 RCA of the Major Export Potential Products of the Competitors in the World Market as well as in the EU-Europe and the USA Markets

Apparel products in the world market as well as the EU & West Europe and the USA markets are the largest markets for Bangladesh's apparel products. The Balassa's Reveal Comparative Advantage (RCA) may vary with factor endowment ranks of the major

competitors. Figure (2) depicts the RCA ranking information of major countries in 2016. According to the result, Bangladesh has the highest RCA in the nine out of the eleven selected products, such as (610462), (610510), (610910), (611020), (611030), (620342), (620462), (620520), and (620630) in 2016, compared to the other exporting countries in the world market. On the other hand, Sri Lanka has the highest RCA for two products out of the eleven apparel products: (610990) and (611120) in 2016. Pakistan and Cambodia have the third and fourth position in the world market respectively. RCA values in the EU-West Europe market are very important to know about the possibility to increase the trade volume in the destination countries for the major competitor countries. This figure (3) shows the RCA which has been calculated in 2016 for Bangladesh, India, Sri Lanka, Vietnam, Pakistan, China, Cambodia and Turkey. The results presented in the figure (3, 4) clearly indicate that Bangladesh has a greater comparative advantage in the EU & West Europe market as well as in the USA market. Vietnam and Pakistan have achieved third position in the USA and the EU-West Europe markets, respectively. Therefore, Bangladesh and Sri Lanka have achieved the first and second positions in RCA in the EU-West Europe and the USA markets.

Figure 2. **RCA of the Major Export Potential Products in the World Market**

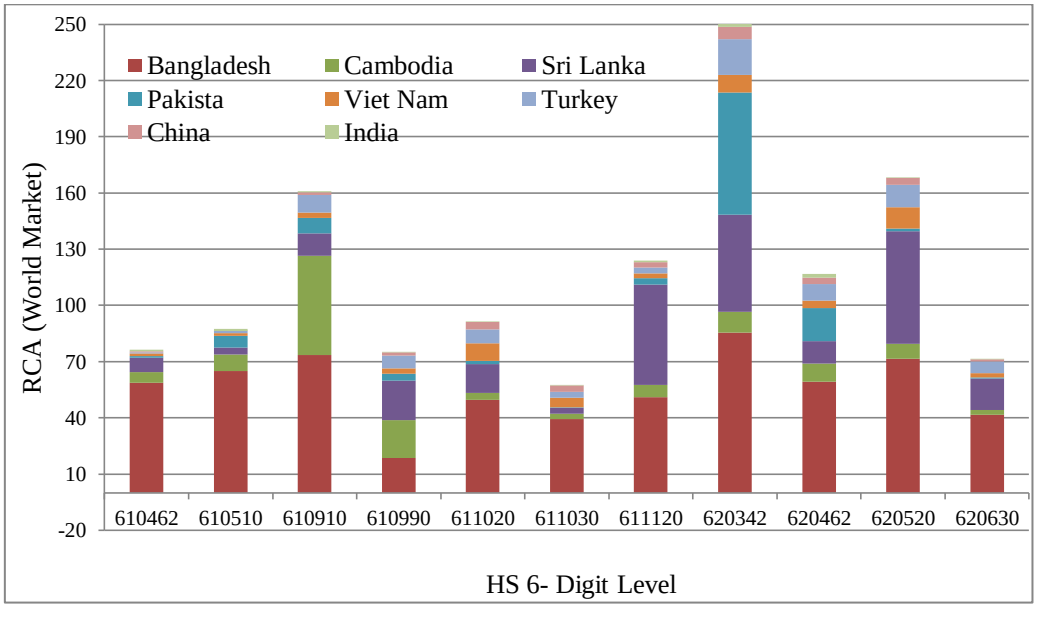


Figure 3. **RCA of the Major Export Potential Products in the EU-West Europe Market**

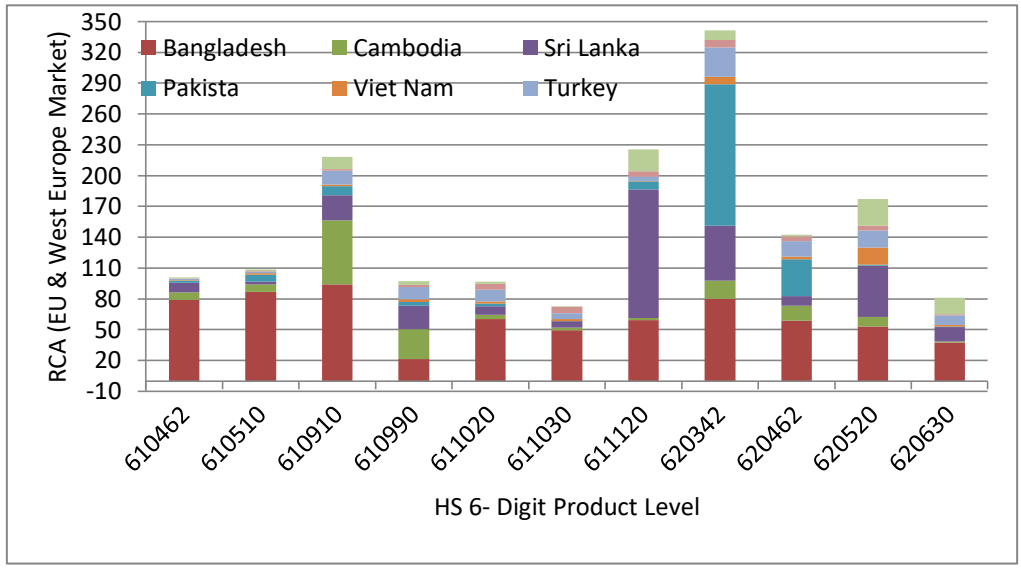
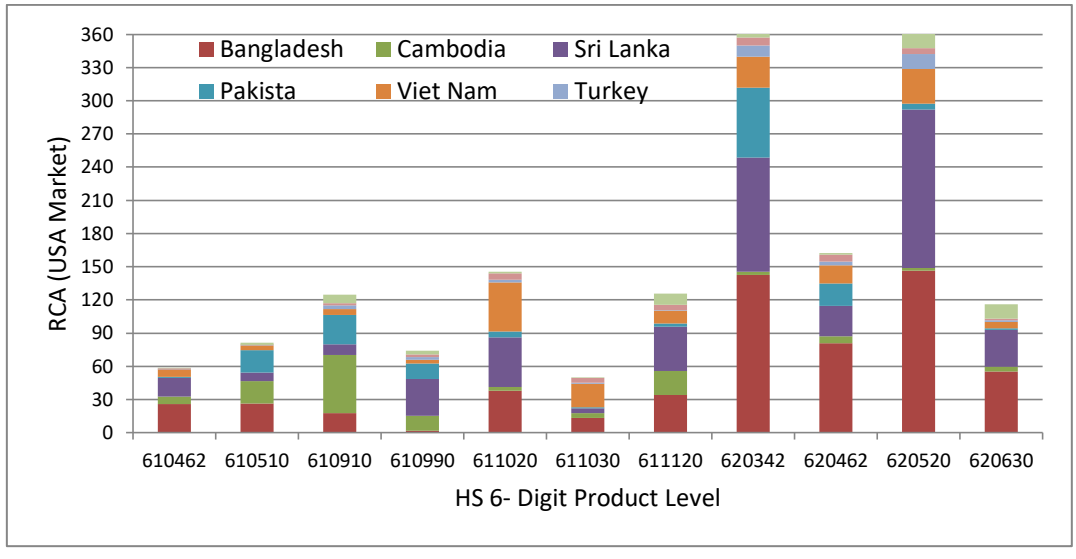


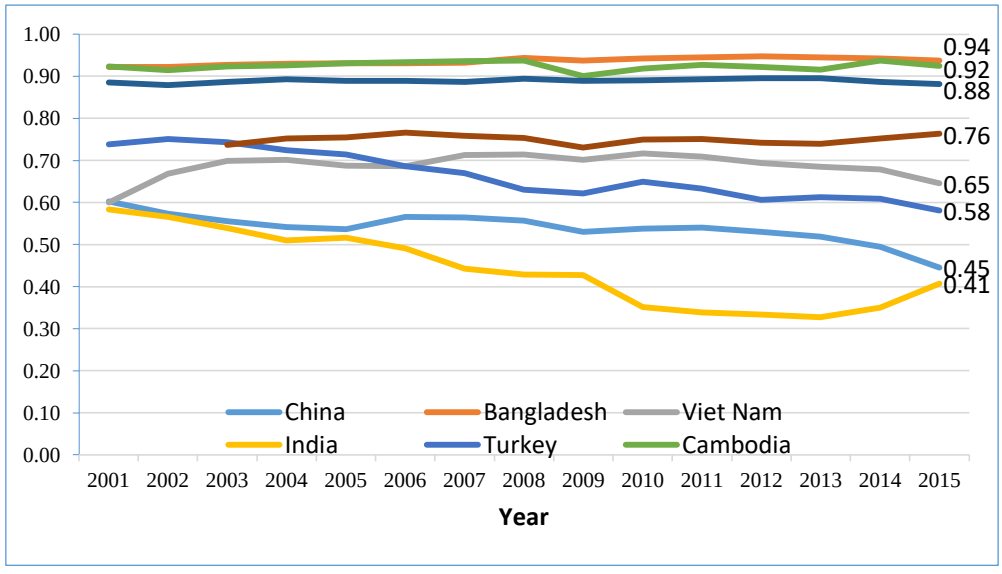
Figure 4. **RCA of the Major Export Potential Products in the USA Market**



5.4 Comparative Advantage by Bangladeshi Apparel Products over the Major Competitors in the World Market

Being an export-oriented country, Bangladesh largely depends on the apparel exports for its export earnings. The share of Bangladesh in the global apparel market has been growing over the last decade [16]. As a result, the comparative advantage is very significant to enhance apparel export to the global market. The Revealed Comparative Advantage (RCA) index ranking, first introduced by Balassa, is the most popular method for explaining the comparative advantages. Figure (5) shows the Revealed Comparative Advantage (RCA) of the apparel products of Bangladesh. These figures indicate the RCA of the apparel products that have achieved stability from 2001 to 2012, but there is more fluctuation-NRCA is from 0.95 to 0.94 respectively in the last three years from 2012 to 2015. After the USGSP suspension, the RCA ranking has fallen gradually. Bangladesh and Cambodia accomplish the first and second position, respectively in the world market in RCA ranking for the apparel products. On the other hand, China, Vietnam and Turkey have gradually fallen in the NRCA status in the world market. China has apparently left apparel production. It has the intention to develop capital-intensive production process. Here, there is a great opportunity to increase own market share in global apparel market for Bangladesh and all other competitors and grasp up the renounced market share by China. Challenges like high-end productivity, properly utilizing lead time, quality production, favourable government policies like trade-friendly policies and environment, easing trade process are highly concerned matters. India has launched a specific target-wise trade policy, where they make an input out a mechanism to be in leading position crossing the Bangladesh and grasp the share of China from the world apparel market. Bangladesh has a great opportunity to be a strong competitor by using its available labour power. It is high time that proper steps are taken and measures on implementing modern technology in production, getting into the green industry, and comes up with more trade-friendly policies are adopted by the country to reap the potential benefits. It can be evaluated that skipping Bangladesh from the Generalized System of Preferences (GSP) in the recent review by the US Government is going to affect the apparel export of Bangladesh to the global market. On the other hand, other competing countries such as Cambodia, Sri Lanka, Pakistan and India have also been increasing their trade volumes of apparel products to the USA market day by day.

Figure 5. Apparel's RCA of the Competitors in the World Market



Source: ITC, Geneva and authors' own calculation, 2016

5.5 Export Potential by Bangladeshi Apparel Products in the Global Market

In line with Bangladesh's current export earnings, apparel sector shows by far the highest export potential augmenting to USD 42.1 billion. Markets for apparel products can be found anywhere in the world. Apparel products have the best opportunities in the EU & West Europe and to the rest of the world market too. Table (2) shows the export potential sectors of Bangladesh. The apparel sector of Bangladesh has the greatest export potential from Bangladesh to the world market as well as the EU-Europe and the USA markets. Apparel shows the highest absolute difference between potential and actual exports in value terms. In the world market, the export potential for fish & shellfish, footwear, and home textile accounted for USD 954.8 million, 991.6 million and 802.3 million, respectively. There are many unlocking export potentials in the EU-West Europe market.

Table 2. **Export Potential Sectors of Bangladesh (in Million US$)**

Potential sector	Export potential (World Market)	Export potential (EU & West Europe Market)	Export potential (USA Market)
Apparel (billion US$)	42.1*	26.1*	6*
Fish and shellfish	954.8	436.5	186.0
Footwear	991.6	591.4	154.7
Other textile products	761.0	323.5	87.5
Home textiles	802.3	428.7	185.4
Skins, leather and products thereof	385.4	152.1	28.6
Other natural fabrics (flax, hemp, etc.)	836.5	48	17.8
Nuts	150.0	52.4	13.1
Miscellaneous manufactured products	199.7	98.7	47.1
Other vehicles and parts	128.6	88.1	16.1

Source: ITC Export potential map (retrieved: 24th December 2017); *billion US$

Bangladesh's export potential for the apparel is huge. More than half of all exports are destined to the EU-West Europe market and there is still growth potential in this market. Table (3) shows major export potential products of Bangladesh. The products with greatest export potential from Bangladesh to the World market are T-shirts & vests of cotton, knit/crochet, men's trousers & shorts of cotton, and women's trousers & shorts of cotton. T-shirts & vests of cotton, knit/crochet, men's trousers & shorts of cotton, and women's trousers & shorts of cotton is the highest export potential products to the EU-West Europe as well as in the United States of America (USA) markets. The unlocking major export potential for Bangladeshi apparel products to the world market, the EU-West Europe market as well as in the USA market worth USD 3.6 billion, 1.9 billion and 453.3 million, respectively.

Table 3. **Major Export Potential Products of Bangladesh**

Product level	Description	World Market (USD billion)	EU & West Europe Market (USD billion)	USA Market (USD million)
610910	T-shirts & vest of cotton	8.20	5.40	680.8
620342	Men's trousers & shorts of cotton	6.80	4.10	1.1(bn)
611020	Jerseys & similar of cotton	3.10	2.00	614.9
620462	Women's trousers& shorts of cotton	3.60	2.20	621.8
620520	Men's shirts of cotton	2.80	1.50	499.4
611030	Jerseys & similar of man-made fibers	2.10	1.40	267.2
610510	Men's shirts of cotton	1.30	0.77	207.3
610462	Women's trousers & shorts of cotton	0.98	0.64	154.0
610990	T-shirts & vests, nes	0.73	0.46	0.00
620630	Women's blouses & shirts of cotton	0.00	0.00	92.0
611120	Babies' garments & accessories of cotton	0.6966	0.43	117.1

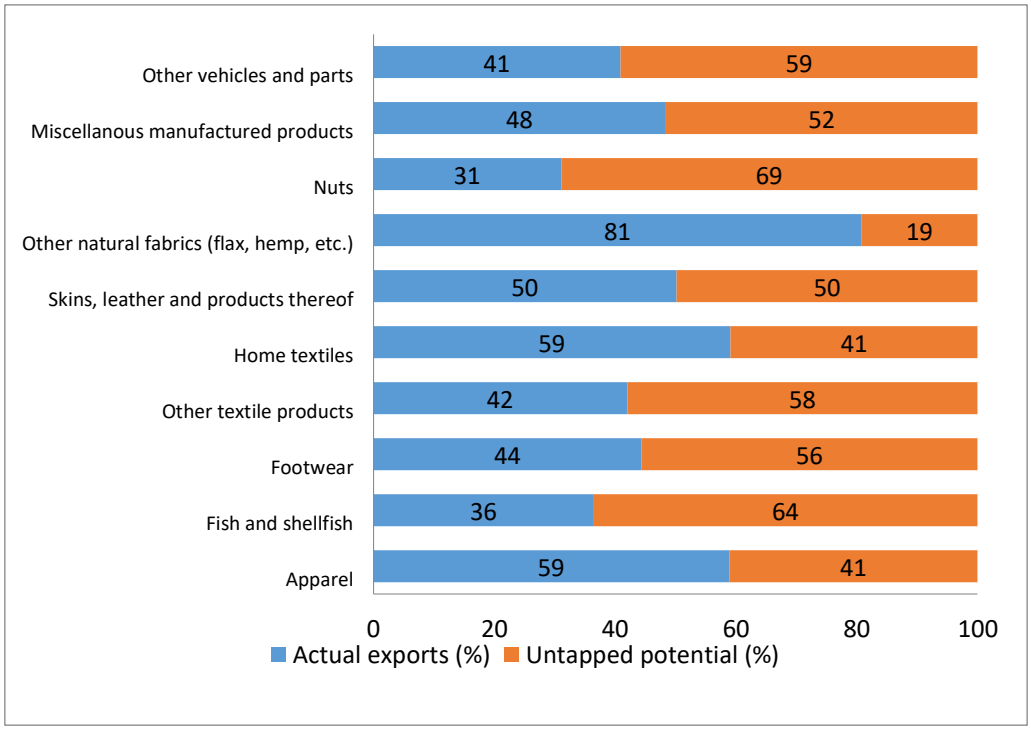
Source: ITC Export potential map (retrieved: 24th December 2017)

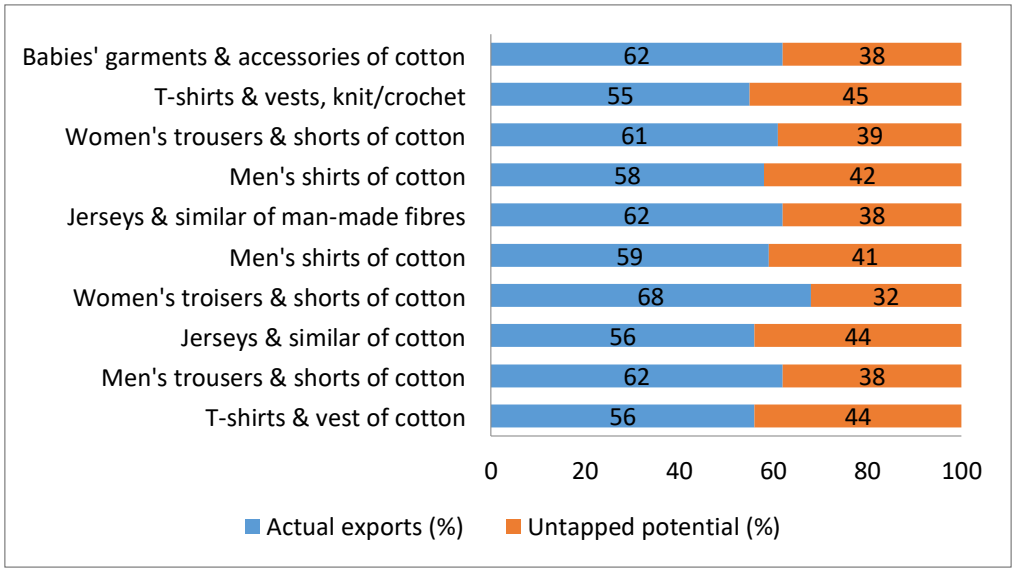
5.6 Untapped Export Potential of Bangladesh

Bangladesh has the most diversified economy, consequently, many sectors and products have an export potential. The highest potential is found in apparel, fish and shellfish, nuts, footwear, and home textile in the world market. Until now Bangladesh has a huge untapped export potential within the apparel sectors, fish and shellfish, footwear, home textile and nuts. The figure 6 shows untapped export potential of Bangladesh in the world

market. Nuts, fish & shellfish, other textile, skins, leather and all others potential sector is the highest untapped export potential of Bangladesh to the world market. On the other hand, Bangladesh has a huge comparative advantage of the apparel products, in which T–shirts and vests, knit/crochet, T–shirts and vest of cotton, jerseys and similar of cotton, men's shirts of cotton, women's trousers and short and babies' garments have an enormous untapped export potential of Bangladesh in the world market.

Figure 6. Untapped Export Potential of Bangladesh in the World Market

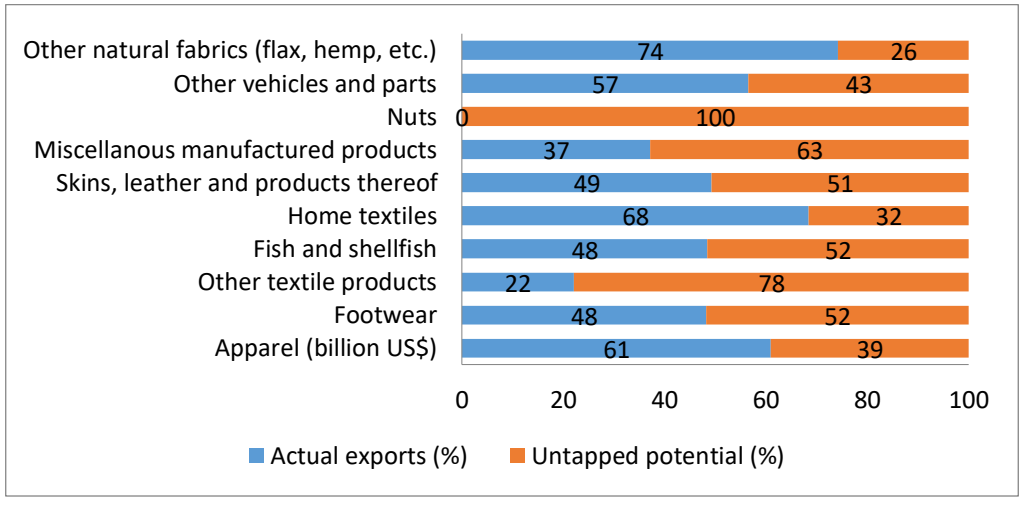


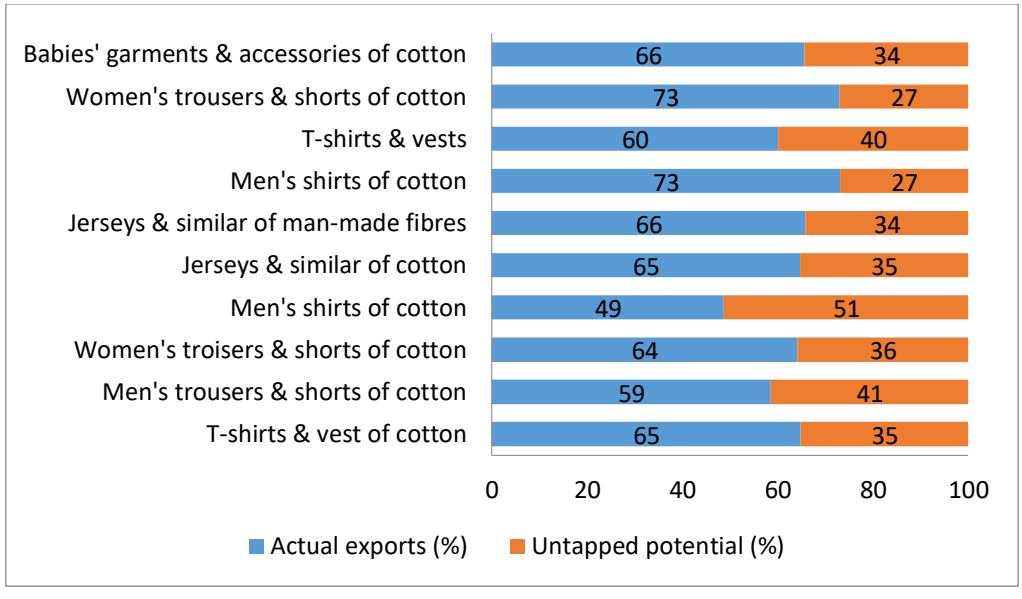


Source: Authors own calculated by ITC Export potential map

The figure (7) shows untapped export potential of Bangladesh in the EU-West Europe market. Nuts, home textile, other textile products, footwear and fish and shellfish is the highest untapped export potential of Bangladesh to the EU-West Europe market. Among them the nuts sector is a fully untapped potential for Bangladesh in the EU-West Europe market. Apparel and other related sectors have captured in this market. Within the apparel sector, Bangladesh has a huge untapped export potential in this market. T– shirts and vests, knit/crochet, T– shirts and vest of cotton, jerseys and similar of cotton, men's shirts of cotton and men's shirts of cotton have a huge untapped export potential in the EU-West Europe market.

Figure 7: Untapped Potential of Bangladesh in the EU & West Europe Market



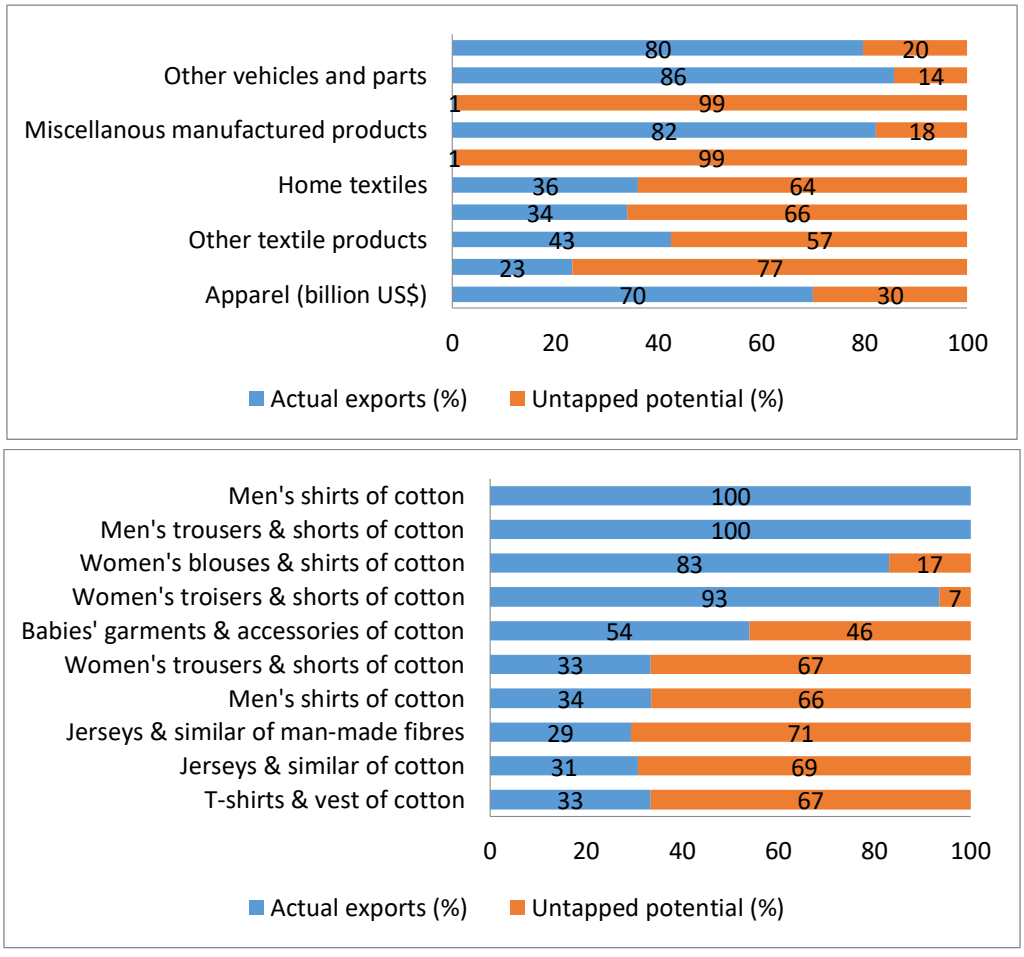


Source: Authors own calculated by ITC Export potential map

The figure (8) shows the untapped export potential of Bangladesh in the USA market. The USA's actual market share in Bangladesh's market is relatively high than the untapped export potential. The export potential assessment indeed suggests that Nuts, Skins, leather products, and footwear have the highest untapped export potential in the

USA market. In the same way, Bangladesh has used maximum actual exports of men's shirts of cotton, men's trousers and shorts, women's blouses and shirts and women trousers and shorts. Roughly 100% of the two products of actual export, Bangladesh have used export potential in the USA market.

Figure 8: Untapped Potential of Bangladesh in the USA Market



Source: Authors own calculated by ITC Export potential map

6. Conclusion and Policy Recommendations

The economic development of a country can ensure strategic modernization in trade and development of basic infrastructure. Classical School of Economist teaches that a country will export that product for which it enjoys a comparative advantage in production. The

technique to denote the products and sectors is getting updated according to demand. The Balassa Index on Revealed Comparative Advantage is mostly used and preferable technique to illustrate comparative advantage for sectors and products due to availability and authenticity of data. Now a day, a consumer country engages in trade examining the price competitiveness in exchange with technological up gradation. It is necessary to know the product potentiality in the destination country. In the same time, the export potential assessment technique is used to find out the export potential of sectors and products through the ITC–Export Potential Map.

To explore comparative advantage, export potential and new products for export diversification, this study has assisted by Balassa index and ITC - Export Potential Assessment respectively. In the line with objective, the study finding has revealed comparative advantage in the major export potential apparel products. It is shown from the RCA analysis that Bangladesh's average comparative advantage is the highest in the EU–West Europe than the USA and the rest of the world markets.

This study also explores the highest export potentials in the apparel sector in the world. The major export potential for Bangladeshi apparel products to the world, the EU and the USA markets are worth of USD 3.6 billion, 1.9 billion and 453.3 million respectively. Moreover, the highest potential is explored in apparel, fish and shellfish, nuts, footwear, and home textile in the world market. Bangladesh has a huge untapped export potential within the apparel sectors, fish and shellfish, footwear, home textile, and nuts. After applying the Export Potential Analysis (EPA), the study explores that Bangladesh has an untapped market worth USD 17.3 billion. The stakeholder should take proper steps to develop economic diplomacy, as well as the empirical policy metrics and to enhance the export basket including the sectors and products which have great export potential in the destination markets to grasp up the opportunity for increasing export volume, GDP growth, employment opportunities, and so on.

References:

Ahmad, N., & Kalim, R. (2013). Changing revealed comparative advantage of textile and clothing sector of Pakistan: Pre and post quota analysis. *Pakistan Journal of Commerce and Social Sciences*, *7*(3), 520.

Balassa, B. (1965). Trade liberalisation and "revealed" comparative advantage. *The Manchester School*, *33*(2), 99-123.

Balassa, B. (1979). The changing pattern of comparative advantage in manufactured goods. *The Review of Economics and statistics*, 259-266.

Balassa, B. (1977). 'Revealed' comparative advantage revisited: An analysis of relative export shares of the industrial countries, 1953–1971. *The Manchester School*, *45*(4), 327-344.

Bangladesh Bank (2018) "*Annual Report 2017 – 2018*". Dhaka, Bangladesh Bank.

Decreux, Y., & Spies, J. (2012, October). Africa's trade potential export opportunities in growth markets. In *International Trade Forum* (No. 4, p. 14). International Trade Centre.

Bastos, P., & Cabral, M. (2007). The dynamics of international trade patterns. *Review of World Economics*, *143*(3), 391-415.

BKMEA. (2018). Apparel Export Statistics of Bangladesh - FY 2017-18. Dhaka.

EPB. (2018, July 16). Services/Statistic data. Retrieved from https://epb.portal.gov.bd: https://epb.portal.gov.bd/site/files/835d1ce0-b985-4965-ae2b-dc5ccd5e4a62

Hadzhiev, V. (2014). More on Measuring the Overall Revealed Comparative Advantage. *TEM journal*, *3*(3), 250.

Laursen, K. (2000). Trade specialisation, technology and economic growth. *Books*.

Liesner, H. H. (1958). The European common market and British industry. *The Economic Journal*, *68*(270), 302-316.

Ministry of Finance (2014) "*Bangladesh Economic Review*" Dhaka, Bangladesh Government Press.

Mohan Kathuria, L. (2013). Analyzing competitiveness of clothing export sector of India and Bangladesh: Dynamic revealed comparative advantage approach. *Competitiveness Review: An International Business Journal*, *23*(2), 131-157.

Rahman, M. H., & Siddiqui, S. A. (2015). RMG: prospect of contribution in economy of Bangladesh. *International Journal of Scientific and Research Publications*, *5*(9), 1-8.

Shohibul, A. (2013). Revealed comparative advantage measure: ASEAN-China trade flows. *Journal of Economics and Sustainable Development*, *4*(7), 136-145.

Spies, Y. D. (2015). *Spotting Products with Export Potential – An ITC Assessment to Support Export Promotion Activities in 64 Developing Countries*. Geneva: International Trade Centre (ITC).

Spies, Y. D. (2016). "*Export Potential Assessments: A methodology to identify export opportunities for developing countries*". 2016, Geneva: ITC Trade Map.

Textile Today. (2018, August 7). Trade & Business. Retrieved from www.textiletoday.com.bd: https://www.textiletoday.com.bd/bd-remains-2nd-largest-rmg-exporter-accounting-6-5-percent/

Yeats, A. J. (1992). What do alternative measures of comparative advantage reveal about the composition of developing countries' exports. *Indian Economic Review*, 139-154.

Appendix A: Product Harmonized System 6 Digit Level (version 2017)

1	610711	611595	620429	621050	030283	030564	630221	420310	
610120	610712	611596	620431	621111	030284	030569	630222	420321	
610130	610719	611599	620432	621112	030285	030571	630229	420329	
610190	610721	611610	620433	621120	030289	030572	630231	420330	
610210	610722	611691	620439	621132	030311	030579	630232	420500	
610220	610729	611692	620441	621133	030312	030614	630239	**7**	
610230	610791	611693	620442	621139	030319	030616	630251	530310	
610290	610799	611699	620443	621142	030323	030617	630260	530390	
610310	610811	611710	620444	621143	030324	030624	630291	530610	
610322	610819	611780	620449	621149	030325	030749	630293	530710	
610323	610821	611790	620451	621210	030329	**3**	630299	530720	
610329	610822	620111	620452	621220	030333	640219	630319	531010	
610331	610829	620112	620453	621230	030355	640220	630391	531090	
610332	610831	620113	620459	621290	030356	640291	630392	560721	
610333	610832	620119	620461	621320	030357	640299	630399	560729	
610339	610839	620191	620462	621390	030367	640319	630419	**8**	
610341	610891	620192	620463	621410	030368	640320	630492	080261	
610342	610892	620193	620469	621420	030369	640340	**6**	080262	
610343	610899	620199	620520	621430	030382	640359	410120	080270	
610349	610910	620211	620530	621440	030383	640391	410150	080280	
610413	610990	620212	620590	621490	030389	640399	410190	080290	
610419	611011	620213	620610	621510	030431	640411	410330	**9**	
610422	611012	620219	620620	621520	030432	640419	410390	420100	
610423	611019	620291	620630	621590	030433	640420	410411	420212	
610429	611020	620292	620640	621600	030439	640510	410419	420219	
610431	611030	620293	620690	621710	030441	640520	410441	420222	
610432	611090	620299	620711	621790	030442	640590	410449	420229	
610433	611120	620311	620719	650100	030443	640610	410530	420239	
610439	611130	620312	620721	650200	030444	640690	410621	420292	
610441	611190	620319	620722	650400	030445	**4**	410622	420299	
610442	611211	620322	620729	650500	030446	630510	410631	660110	
610443	611212	620323	620791	650699	030449	630520	410632	670300	
610444	611219	620329	620799	650700	030451	630532	410691	670411	
610449	611220	620331	620811	**2**	030452	630533	410692	670419	
610451	611231	620332	620819	030192	030453	630539	410711	670420	
610452	611239	620333	620821	030242	030454	630590	410712	860800	
610453	611241	620339	620822	030245	030455	630612	410719	940179	
610459	611249	620341	620829	030246	030459	630622	410791	940180	
610461	611300	620342	620891	030247	030541	630629	410792	940490	
610462	611420	620343	620892	030254	030542	630690	410799	950300	
610463	611430	620349	620899	030255	030543	630710	411200	950590	
610469	611490	620411	620920	030256	030544	630790	411310	950639	

1. Apparel

2.Fish and shellfish

3. Footwear

4. Other textile product

5. Home textiles

6. Skins, leather and products thereof

7. Other natural fabrics (flax, hemp, etc.)

8. Nuts

9. Miscellaneous manufactured product

10. Other vehicles and parts

610510	611510	620412	620930	030259	030549	631010	411320	950699	
610520	611521	620413	620990	030271	030551	631090	411390	**10**	
610590	611522	620419	621010	030272	030559	940430	420211	871200	
610610	611529	620421	621020	030273	030561	**5**	420221		
610620	611530	620422	621030	030279	030562	630130	420231		
610690	611594	620423	621040	030282	030563	630210	420291		

***Appendix B*: Overview of all data sources**

Variable	Variable	Further information
Export and import values	ITC Trade Map	2012–2016
Ad-valorem tariffs	ITC Market Access Map	Latest year available as of Sep. 2017
Price elasticities	GTAP (Hertel et al., 2004)	Hertel, Hummels, Ivanic and Keeney (2004)
Distances	CEPII GeoDist (Mayer and Zignago, 2011)	CEPII GeoDist (Mayer and Zignago, 2011), based on geodesic distances between main cities (with population figures from 2004). Geodesic distance between capital cities is used for missing countries.
GDP growth projections	IMF World Economic Outlook database	2016–2021 (as of October 2017)
Population projections	ILOStat database	2016–2021 (UN estimates and projections, July 2015)
Land endowment by climate type	GTAP "Land Use" database, version 7 (March 2011)	Avetisyan, Baldos and Hertel (2011)
GDP (current US$) and population data	World Bank WDI database	2012–2016

***Appendix C*: The Most Potential Product for Bangladesh**

HS 6	Product Description
610462	Women's or girls' trousers, bib and brace overalls, breeches and shorts of cotton, knitted ...
610510	Men's or boys' shirts of cotton, knitted or crocheted (excluding nightshirts, T-shirts, singlets ...
610910	T-shirts, singlets and other vests of cotton, knitted or crocheted
610990	T-shirts, singlets and other vests of textile materials, knitted or crocheted (excluding cotton)
611020	Jerseys, pullovers, cardigans, waistcoats and similar articles, of cotton, knitted or crocheted ...
611030	Jerseys, pullovers, cardigans, waistcoats and similar articles, of man-made fibers, knitted ...
611120	Babies' garments and clothing accessories of cotton, knitted or crocheted (excluding hats)
620342	Men's or boys' trousers, bib and brace overalls, breeches and shorts, of cotton (excluding ...
620462	Women's or girls' trousers, bib and brace overalls, breeches and shorts of cotton (excluding ...
620520	Men's or boys' shirts of cotton (excluding knitted or crocheted, nightshirts, singlets and ...
620630	Women's or girls' blouses, shirts and shirt-blouses of cotton (excluding knitted or crocheted ...

***Appendix D*: European Union and West Europe**

Andorra	Denmark	Greece	Luxembourg	Slovenia
Austria	Estonia	Greenland	Malta	Spain
Belgium	Faroe Islands	Hungary	Netherlands	Sweden
British Indian Ocean Territories	Finland	Iceland	Norway	Switzerland
Bulgaria	France	Ireland	Poland	United Kingdom
Croatia	French South Antarctic Territories	Italy	Portugal	
Cyprus	Germany	Latvia	Romania	
Czech Republic	Gibraltar	Lithuania	Slovakia	

Effectiveness of Macroprudential Policy in Bangladesh

Md. ZulkarNayn[1]
Mohammad Shahriar Siddiqui[2]

ABSTRACT

Macroprudential policies for achieving financial stability gained global attention of the government policy makers and economists after the global financial crisis (GFC). There are challenges in applying macroprudential policies because it is difficult to identify financial system's vulnerability early enough and also its effectiveness depends on financial structure, developments in the financial market as well as political and economic scenario of a country. Bangladesh Bank (BB), as central bank and monetary authority of the country, uses micro as well as macroprudential tools as complementary to monetary and exchange rate policies such as prudential regulations for consumer finance and small enterprise financing, provision against loans and advances, time-varying capital requirement and risk weights against various assets, open position limit etc. There appears to be a lack of dynamism in adopting key macroprudential tools to counter procyclical behavior of the banking sector, while lack of effective coordination between monetary policy measures and macroprudential tools was also observed. Macroprudential regulations of BB partially contributed to check overexposure of the banking sector to capital market at the cost of a sudden crash at the end of 2010, but failed to rein in excessive credit growth during 2010-12 and consumer credit growth during 2015-17. A reduction in provision for standard SME credit in 2012, supported growth in SME credit disbursement contributing to diversifying risks in the banking sector. Some relaxations in prudential norms for residential housing loans have positive impact on growing home loan.

JEL classification: G18, G21, G28, E58.

Keywords: Macroprudential policy, Systemic risk, Procyclicality, and Financial stability.

[1]General Manager, Bangladesh Bank, Rangpur. Cell: 8801817518662, E-mail: mdzulkar.nayn@bb.org.bd
[2] Deputy General Manager, Banking Regulation & Policy Department, Bangladesh Bank. Cell: 8801753078226, E-mail: shahriar.siddiqui@bb.org.bd

I. INTRODUCTION

Macroprudential policy aims at limiting systemic or system-wide financial risk that can have serious consequences for the real economy. Although Macroprudential policies may intend to support growth at the time of downturn, often the focus of the policies is to discourage risky lending and excessive credit growth which could lead to imbalances in the financial system and thereby risking financial stability.

The term "macroprudential" has risen from virtual obscurity to extraordinary prominence following the recent global financial crisis (GFC), which revealed that price stability does not guarantee macroeconomic stability. Macroprudential policy instruments may include a range of constraints on leverage, credit disbursement and portfolio composition of financial intermediaries with the expectation that they could contain excessive risk taking by financial intermediaries as well as households.

According to Lim et al (2011) macroprudential policy instruments may be used to mitigate four broad categories of systemic risks: risk generated by strong credit growth, risk arising from excessive leverage, systemic liquidity risk and risk related to large and volatile capital flows. Macroprudential policy instruments may serve to safeguard individual institution at micro-level as well as financial system at macro-level, thereby reinforcing each other.

There are mainly two views of financial crises: endogenous-cycles view and exogenous shock view. The endogenous-cycle view (Minsky, 1992) says during economic prosperity financial institutions engage in riskier investments resulting in build-up of financial imbalances. On the other hand, exogenous-shock view assumes that a financial crisis occurs because of extensive financial distress caused by an exogenous shock i.e., oil prices shock, a shift in risk aversion and exchange rate preferences. The endogenous-cycle view gets priority in designing macroprudential tools towards achieving financial stability.

Emerging market central banks have a long history of using macroprudential instruments particularly since the Asian financial crisis. In the aftermath of the crisis central banks in the region deployed macroprudential tools to deal with the consequence of crisis and then to prevent vulnerabilities from building up again. Similarly, central banks in Latin America and other regions used macroprudential tools to prevent large swings in external financing from turning into domestic financial booms and busts.

Bangladesh Bank (BB) has a long history of using macroprudential policy to ensure sound lending practices in banking. However, the effectiveness of such macroprudential policy has seldom been examined. Researcher and academics have recently come forward to examine the effectiveness of macroprudential policy tools and regulations in the context of advanced and emerging market economies. In the context of Bangladesh, no significant work has been undertaken focusing on the effectiveness of macroprudential policies. This paper intends to fill up this void and shed some lights on the tools used by Bangladesh Bank and promote discussion for further study in this area.

II. OBJECTIVES OF THE STUDY

The study has two broad objectives:

2.1 To find out major macroprudential policy and tools used by Bangladesh Bank particularly in the banking sector of Bangladesh during 2010 to 2018.

2.2 To explore effectiveness of the macroprudential policy and tools in achieving intended goals.

2.3 To find out convergence and divergence between monetary policy and macroprudential policy.

The rest of the paper proceeds as follows: Section III describes methodology; Section IV discusses the literature on macroprudential policies and their implications. Section V discusses various macroprudential tools used in Bangladesh. Section VI presents analysis of the effectiveness of macroprudential policies in Bangladesh and Section VII concludes. The paper ends with policy recommendations at Section VII.

III. METHODOLOGY

This study examined macroprudential regulations and tools adopted and implemented by Bangladesh Bank during the period from 2010 to 2018 by going through various circulars, quarterly and annual reports of Bangladesh Bank.

Growth and trend analysis of related macroeconomic data such as consumer finance, SME credit, housing loan, total credit and advances in the banking sector were carried out to find out effectiveness of major macroprudential tools used and their implication.

A summary table showing countercyclical prudential regulations in terms varying risk weights for assets and provision requirement for standard assets during the period under review was constructed.

In order to find coordination between monetary policy and macroprudential policy stance as shown by Verma (2016) for India, BB's monetary policy stance was identified through distinct phases during 2010-18 and changes in monetary and macroprudential policy tools in Bangladesh during the period were shown.

For assessing effectiveness of BB's macroprudential policy in achieving underlying goals, this study used simple analysis of growth and trends in macroeconomic variables avoiding any complicated econometric models, which were still at a developing stage.

IV. LITERATURE REVIEW

The origin of the term "macroprudential" can be traced back to the late 70s (Clement, 2010). One of the major concerns at this time in the financial regulatory circles was the rapid growth of loans to developing counties and its potential negative impact on financial stability. In 1979, the term "macroprudential" was first introduced at a meeting in the Cooke Committee (the predecessor of the present Basel Committee on Banking Supervision, BCBS) to address the issue of international bank lending. After that the term "macroprudential" was introduced in a background document prepared by the Bank of England (1979), which says (BIS, 2010):

"*Prudential measures are primarily concerned with sound banking practice and the protection of depositors at the level of the individual bank. Much work has been done in this area – which could be described as the 'micro-prudential' aspect of banking supervision. […] However, this micro-prudential aspect may need to be matched by prudential considerations with a wider perspective. This* ***'macro-prudential'*** *approach considers* ***problems that bear upon the market as a whole as distinct from an individual bank, and which may not be obvious at the micro-prudential level***."

In the wake of Asian financial crisis (1997), a report of The International Monetary Fund (IMF, 1998) says:

"*Effective bank supervision must be seen by banks as a continuous presence. This is mainly achieved through off-site monitoring, both micro- and macro-prudential in scope. […] Macro-prudential analysis is based on market intelligence and macroeconomic information, and focuses on developments in important asset markets, other financial intermediaries, and macroeconomic developments and potential imbalances*"

In October 2000, the General Manager of the BIS, Andrew Crockett, delivered a speech at the International Conference of Banking Supervisors contrasting the microprudential and macroprudential approaches to regulation and supervision and suggested that achieving financial stability called for a strengthening of the macroprudential perspective. Well before the subprime crisis, Borio and Lowe (2002a and b) suggested a combination of sustained rapid growth in credit and asset prices can indicate an impending financial crisis, and contended that the gap between the credit-to-GDP ratio and its trend is a key indicator of financial imbalances.

Kuttner & Shim (2012) by using various housing-related macroprudential measures for 57 advanced and emerging market economies for the period 1980–2011, found that LTV limits, reserve requirements and risk weights are quite effective in dampening growth in housing prices and housing credit. Similarly, Arregui et al (2013) found that these tools were effective in reducing credit growth and house price growth. Zhang & Zoli (2014) found that macroprudential policy has contributed in reducing credit growth in Asia. Particularly housing-related measures such as loan-to- value (LTV) ratios, debt-to-income (DTI) ratios, risk weights and loan loss provisions on mortgage loans were found to have a significant impact. Changes in reserve requirements and capital regulation were not found to have any significant effect on bank credit.

The IMF (2013) argues that monetary policy alone cannot achieve financial stability as the causes of financial instability may not always be related to the degree of liquidity in the system which monetary policy can fix. When financial distortions are more acute in some sectors of the economy than in others, as is often the case, monetary policy is a very blunt tool as it will also affect many sectors in an unintended manner

Claessens et al (2014) looked at 48 advanced economies and EMEs for 2000–2010 using bank level data and found that measures aimed at borrowers such as caps on DTI and LTV ratios and limits on credit growth and foreign currency lending are effective in reducing asset growth.

A BIS-coordinated research project by a group of Latin American central banks found that macroprudential measures tend to be more effective in dampening the credit cycle if accompanied by countercyclical monetary policy (Upper, 2017). A study by the Hong Kong Monetary Authority shows that loan-to-value ratios (LTVs) strengthened banks' resilience to property shocks even if they had limited impact on house prices themselves.

A large body of literatures exists in the global context studying the impact of macroprudential policies. Some are devoted to in the context of Asian economies too. Cerutti et al (2015), reporting data for 119 IMF member countries on the use of twelve types of macroprudential policies for the period 2000-13, conclude that an increasing trend is clearly visible for all with a tripling of the average number of measures used in Emerging Asia over the period and a doubling in low-income developing countries.

Bruno et al (2015), providing a comparative assessment of the effectiveness of macroprudential policies in 12 Asia-Pacific economies, find that banking sector capital flow management (CFM) polices and bond market CFM policies are effective in slowing down banking inflows and bond inflows, respectively. They also find that macroprudential policies are more pragmatic when they complement monetary policy by reinforcing monetary tightening, than when they act in opposite directions.

Malovaná & Frait (2016), using data for the Czech Republic and five euro area countries, show that monetary tightening has a negative impact on the credit-to-GDP ratio and the non-risk-weighted bank capital ratio, while these effects have strengthened considerably since mid-2011. To them, the effect of the higher bank capital ratio is associated with some degree of uncertainty and coordination of the two policies is necessary to avoid an undesirable policy mix preventing effective achievement of the main objectives in the two policy areas. Lee et al (2015), presenting an empirical framework for analyzing effectiveness of macroprudential policies in controlling credit growth, leverage growth, and housing price appreciation, find that macroprudential policies can promote financial stability in Asia.

Wang & Sun (2013), in the context of China, find that some macroprudential policy tools (e.g., the reserve requirement ratio and house-related policies) are useful, but they cannot guarantee protection against systemic risk in the prevailing economic and financial environment. To them, better-targeted macroprudential policies have greater potential to contain systemic risk pertaining to the different sizes of the banks and their location in regions with different levels of economic development.

Gomez et al (2017) found that, in case of Colombia which used countercyclical reserve requirement and dynamic provisioning scheme for commercial loans for 2006-09 employing loan account level data, aggregate macroprudential policy stance worked effectively in stabilizing credit cycles and in reducing bank risk-taking.

Erdem et al (2017) using data of 30 EMEs (including India) for 2000-13 and applying panel vector auto-regression (VAR) found that macroprudential policies are effective in limiting domestic credit growth especially during the expansion phase of the credit cycle. An aggregate macroprudential policy (MPP) index was constructed by Verma (2016) for Indian financial system using risk weights and provisioning for standard assets for housing, CRE, consumer loans, capital market and CRR and he found the impact of the Index on credit growth with a lag.

With the introduction of the countercyclical capital buffer in the Basel III framework, policymakers have been focusing on the credit gap more closely. Basel III has placed a prominent role on the credit-to-GDP gap to act as a signaling guide early warning indicator (EWI)) for policymakers in setting the countercyclical capital buffers. The countercyclical capital buffer aims to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate.

According to Akhtaruzzaman (2017), Bangladesh used following macroprudential policy tools:

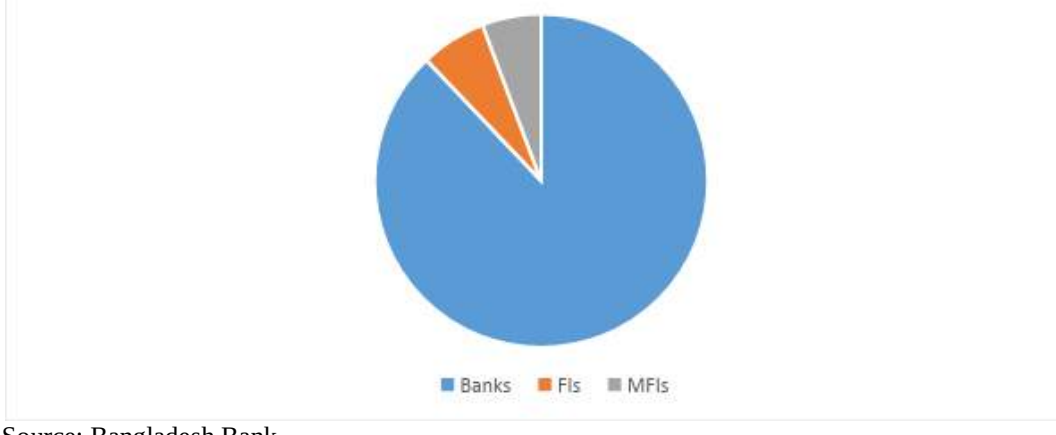
i. Loan-to-value limits
ii. Time varying reserve requirement (CRR and SLR)
iii. Advance-to-deposit ratio (ADR) for banks
iv. Cap on capital market exposure of banks
v. Countercyclical capital buffer
vi. Limits on net open currency position
vii. Framework for identifying domestic systemically important banks
viii. Identification of D-SIBs and imposition of surcharges on them
ix. Resolution requirement (LOLR) and disclosure policy for D-SIBs

He also added some other initiatives in Bangladesh having macro-prudential focus are Central Database for Large Credit (CDLC) to prepare a Corporate Watch List, Systemic Risk Dashboard, working paper on Dynamic Provisioning, Interbank Transaction Matrix and Bank Health Index and HEAT Map.

V. MACROPRUDENTIAL REGULATIONS IN BANGLADESH

Bangladesh Bank Order 1972 allows Bangladesh Bank (BB) to serve as the macroprudential authority for banking and financial sectors. BB applies a number of macroprudential tools considering financial and business cycles of the country. Before discussing macroprudential regulations applicable to banks and financial institutions a brief introduction to financial system of Bangladesh may be pertinent. Financial system of Bangladesh consisted of six state owned commercial banks, two specialized banks (state owned), 41 domestic private sector banks (including Islamic banks), nine foreign banks, 5 non-scheduled banks and 34 Non-bank financial institutions (FIs) as of December 2018. The number of bank branches stood at 10,286 as of December 2018. Bangladesh Bank, the central bank, is the main regulator of banks and non-bank financial institutions. Besides, Bangladesh Securities & Exchange Commission (BSEC) regulates the banks and financial institutions that are listed on the two Stock Exchanges. Some banks and financial institutions also have subsidiary companies working as brokerages houses and merchant banks. Insurance industry of Bangladesh consists of 32 life insurance and 46 nonlife insurance companies that are regulated by Insurance Development and Regulatory Authority (IDRA). In Bangladesh there are also 806 microfinance institutions (MFIs) regulated by Microcredit Regulatory Authority (MRA). As of March 2018, share of banks, non-bank financial institutions (FIs) and microfinance institutions (MFIs) in total private sector credit are 88%, 6.3% and 5.7% respectively. Therefore, in studying macroprudential policy the banking sector has been focused.

CHART 1: SHARE IN PRIVATE SECTOR CREDIT AS AT MARCH 2018 (BDT BILLION)



Source: Bangladesh Bank,

Following Box contained a list of Macroprudential tools and regulation those currently are enforcing in the banking system of Bangladesh:

BOX 1: PRUDENTIAL REGULATIONS IN BANGLADESH

(i) Broad-Based Tools Applied to the Banking Sector:

- Countercyclical capital buffer; approved in April 2014, however, no positive rate applied yet.
- Capital conservation buffer; announced in Dec 21, 2014 and became effective from Jan 1, 2016
- Limit on leverage ratio 3%; announced in Dec 21, 2014 and became effective in Jan 2015
- Cap on credit growth; applied on state-owned banks only

(ii) Household Sector Tools:

- **Cap on credit growth to the household sector-** growth rate in total loans under 'Consumer Financing' must not exceed the growth rate of bank's total loans
- **Cap on loan-to-value ratio**
  - Housing finance 70:30
  - Auto loan 50:50
  - Other consumer financing 30:70
- **Cap on debt-service-to-income ratio**
  - Auto loan 33%
  - Consumer Durables/ Professional Loans- 33%
  - Unsecured Personal Loan-35%
- **Limit on amortization periods**
  - House loan 25 years
  - Auto loan - as described in the prevailing Import Policy Order
  - Consumer Durables Loan - Minimum 12 months/24 months &/or maximum 36 months
  - Professional Loans - Minimum 12 months & maximum 48 months
  - Unsecured Personal Loan - Minimum 12 months/24 months and/or maximum 36 months
- **Restrictions on unsecured loans**
  - Personal loans including loans for the purchase of consumer durables - BDT 0.5 million
  - Credit card - BDT 1 million
  - Auto loan- BDT 4.0 million
- **Exposure caps on household credit**
  - Housing loan- BDT 12 million

(iii) Corporate Sector Tools

- **Capital requirements:**
  - Risk-weighted capital charge for banks' exposures to corporate as per corporate ratings
  - Foreign-currency-denominated loans: no cap in place, but debt-equity cap of 70:30 with floating interest rate based on LIBOR.
- **Other measures to mitigate systemic risks from loans to the corporate sector**:
  - Regularly monitor indebtedness of large corporate borrowers through Central Database for Large Credit (CDLC).

(iv) Liquidity Tools Applied to the Banking Sector:

- Liquidity Coverage Ratio (LCR)
- Net Stable Funding Ratio (NSFR)
- Loan-to-deposit ratio: Conventional banks 83.5%; Islamic Shari'ah banks 89%
- Limits on maturity mismatches: the upper limit on maturity mismatches for cash outflow

in one-month time bucket 19% of balance sheet
- CRR 5.5% bi-weekly; 5% daily
- SLR 13% (for conventional banks); 5.5% (for Islamic banks)
- Limits on net open foreign exchange positions 20% of eligible (regulatory) capital

(v) Tools to Address Risks from Systemically Important Institutions and Interconnectedness within the Financial System

- Interbank Transaction Matrix (ITM)
- Bank Health Index
- Applying capital surcharges for systemically important banks

Source: Different circulars, guidelines and discussion with concerned departments of Bangladesh Bank.

Prudential regulations of Bangladesh Bank (BB) also includes loan classification and provisioning requirement, rescheduling and restructuring of loans and advances, risk weights for various types of assets for calculating capital adequacy, single borrower exposure limits, leverage and liquidity ratios following Basel II and Basel III. Some important macroprudential tools used to contain excessive risk taking by banks in Bangladesh have been discussed below.

V.1 Prudential Regulations for Banks under Consumer and Small Enterprise Financing

In 2004, Bangladesh Bank issued two prudential guidelines (1st edition) applicable to banks, one for consumer financing and another for small enterprise financing through BRPD Circular No.07; 03 November 2004.The guidelines for consumer financing titled "Prudential Regulations for Consumer Financing" contains prudential regulations for consumer financing. It gave a detailed policy and procedural guidelines for ensuring sound banking practices and consumer protection. The guidelines contains 32 regulations, which includes among others maximum limits for loans and advances, debt equity ratio or loan to value (LTV) limits for various types of consumer loans including auto loans and housing finance, limits on banks' total exposure to consumer finance in terms of its equity.

Product Program Guidelines (PPG) under BB's Prudential Regulations for Consumer Finance (2004) articulated fundamental policy guidelines for consumer financing. Before launching consumer finance products, banks are required develop fully documented product program guidelines, which shall include objective/quantitative parameters for the eligibility of the borrowers and determining the maximum permissible limit per borrower. Consumer finance in Bangladesh under BB's prudential regulations are: Auto Loan, Consumer Durable Loans, Loans for Professionals, Unsecured Personal and Credit Cards.

Prudential Regulations for Consumer Finance (2004) imposed following limits for aggregate amount of consumer financing facilities (Prudential Regulation 2):

TABLE1: PRUDENTIAL REGULATION FOR CONSUMER FINANCE

Classified Consumer Finance to Total Consumer Finance (%)	Maximum Limit
a) Below 5%	10 times of the equity
b) 6% - 10%	6 times of the equity
c) 11% - 15%	4 times of the equity
d) 15% and over	Equal to equity

It may be mentioned here that Prudential Regulation-4 for small enterprise financing (2004) also imposed similar aggregate limits. However, these limits are so high and unrealistic that no one cares about such limits, and cannot be called prudential limits.

According to Prudential Regulation-3 for Consumer Financing (2004) banks would ensure that the total installment of the loans extended by them is commensurate with the take home income/disposable income and repayment capacity of the borrower. This is expected to ensure customer protection as well as minimize default risk for banks.

V.2 Loan to Value Ratio and Other Limits for Consumer Finance

Global financial crisis of 2007-09 showed that housing price bubble and bust can have a disastrous impact on the economy. Government policy and the central bank's prudential regulations on housing finance can have a great influence in shaping consumer demand for housing finance. According to BB's Prudential Regulations (2004) in respect of home loan by the banks per party limit was BDT 7.5 million and LTV or debt-equity ratio was 80:20, for auto loan limit was BDT 5.0 million and LTV or debt-equity ratio was 90:10. Besides, credit card and personal loan were maximum BDT 0.5 million as unsecured with BDT 2.0 million as secured and maximum BDT 0.3 million as unsecured with BDT 1.0 million as secured respectively.

BB's amendment (BRPD Circular No. 10; 20 August, 2005) said housing finance for real estate business and commercial complex such as super market and shopping mall etc. should be excluded from the consumer finance category. In order to arrest the flow of credit from banks to unproductive sector, banks were also instructed not to provide any credit facility for purchasing land.

On 16 June 2010, BB set the maximum per party limit in respect of housing finance by the banks at BDT10 million with maximum debt equity ratio of 80:20. Subsequently BB instructed (BRPD circular No. 03; 22 January 2012) that loan-margin ratio for house finance under consumer financing be maintained at 70:30. Besides, commercial banks were instructed to limit their total exposure under housing finance or home loan below 10% of their net consumer advance.

Debt Equity Ratios or Loan to Value (LTV) ratios for different types of consumer finance are thought to be important prudential regulations among others for limiting credit growth and demand. Following table shows changes in LTV ratios for SME and consumer finance (particularly auto loans and housing finance) over period from 2010 to June 2018.

TABLE 2: PRUDENTIAL REGULATION: LTV AND OTHER LIMITS FOR CONSUMER FINANCE

Date	Consumer Finance			
	Auto Loan	**Housing Finance**	**Credit Card**	**Personal Loan**
BRPD Circular no. 23;June 16,2010		LTV 80% Limit BDT1crore		
BRPD Circular 3 January 22,2012	LTV 30%	LTV 70%		
BRPD Circular no. 5; April 25, 2012	Consumer credit growth not more than average total loan growth			
BRPD Circular no. 12; August 13,2014	LTV 50% Limit:40 lac			
BRPD Circular no. 1; January 1,2015		LTV 70% Limit BDT1.2 crore		
BRPD Circular no. 4; April 3,2017	Consumer credit growth not more than total loan growth		Max. BDT10 lac (unsecured) and BDT25 lac (secured)	Max. BDT5 lac (unsecured) and BDT20 lac secured)

Source: Circulars and Guidelines of Bangladesh Bank

BB issued a circular in April 2012 (BRPD Circular No. 05; 25 April 2012) saying there has been an increase in consumer credit with concentration in unproductive sectors and thereby instructed banks to limit consumer credit growth no more than average growth of total credit. Then again BB issued a circular in April 2017 (BRPD Circular No. 04; 03 April 2017) saying the consumer product market in Bangladesh has been growing rapidly over the last few years and rising per capita income has enabled growth in consumer

spending; considering the existing market price and the increasing demand for consumer goods, it has been decided to make changes in Regulation-13 and Regulation-30 of the Prudential Regulations for Consumer Financing (2004). BB thereby increased credit card limit (unsecured) from BDT5 lac to BDT10 lac, personal loan limit (secured) to BDT20 lac. Besides, BB instructed banks to provide consumer finance such a way that, in any case, the growth rate in total loans under 'Consumer Financing' must not exceed the growth rate of bank's total loans.

BB's Prudential Regulation (2004) for consumer financing has stipulated that banks should maintain a general reserve at least equivalent to 3% of their consumer finance portfolio to protect them from the risks associated with the economic cyclical nature, while provisions against unsatisfactory, substandard, doubtful and loss category of credits required provision of 10%, 20%, 50% and 100% respectively. However, in the August of 2005, BB made amendments (BRPD Circular No. 10; 20 August 2005) rescinding the category of unsatisfactory and saying banks were required to maintain 2% General Provision only to revert back to 5% provision in December, 2005 (BRPD Circular No.17; 06 December 2005). Again in February 2006, BB reduced general provision for housing finance and loans for professional to set up business under consumer finance to 2% (BRPD Circular No. 01; 08 February 2006). Debt equity ratio for all other consumer loans including motor car loans was set at 50:50 in December 2010 (BRPD circular 34, 2010); Debt equity ratio for consumer financing (auto loan) was later set at 30:70 (BRPD Circular No.03; 22 January 2012).

V.3 Risk Weights under Basel II and III and Provision Requirement

Risk weights for different types of exposure for calculating minimum capital requirement are given under BB's Guidelines on 'Risk Based Capital Adequacy (RBCA)' for Banks in line with Basel II, which came into force from January 01, 2010 replacing the previous approach for calculating capital adequacy of banks. Again a revised guidelines on RBCA was issued on August 3, 2010 (BRPD Circular 24) incorporating all instructions issued till July 31, 2010, namely instructions issued vide BRPD Circular No. 07/2008, 09/2008, 05/2009, 13/2009,20/2009, 10/2010, 11/2010, 12/2010, 13/2010 and BRPD Circular Letter No. 05/2009.

From 2006 onward, BB required (BRPD Circular No.05; 05 June 2006) general provision of 1% against all unclassified loans (other than loans under Small Enterprise and Consumer Financing and Special Mention Account) and 5% against 'Special Mention A/C'; and provision for all short term agricultural and microcredit credits except

'Bad/Loss' (i.e. 'Doubtful', 'Sub-standard', irregular and regular credit accounts): 5%. BB introduced 0.5% general provision against Off-balance sheet exposures respectively from December, 2007 and 1% general provision against Off-balance sheet exposures (BRPD Circular No.10/2007).

On 27 October, 2010 BB issued a circular (BRPD Circular No. 32; 27 October 2010) saying financing by banks to dealers/subsidiary companies/any other company or individual became vulnerable due to volatility of market prices of shares/debentures; considering the investment risks in the capital market it has now been decided that banks shall maintain 2% general provision instead of 1% against unclassified amount of any kind of funded loan disbursed to stock dealers enlisted with Stock Exchange, separate subsidiary company established by a bank company for dealing business in share brokerage and merchant banking and any other company or institution or individual for dealing such business.

Following Verma (2016) the Table-3 shows countercyclical prudential regulations and their variations during 2010 to 2018. It can be seen that risk weights for capital market exposure was set 125 during January-June, 2010, which remained static over time till now (September 2018). Risk weights for claims against residential property, commercial real estate, consumer finance and related provisioning requirement on standard assets remained static during the period of 2010 to 2018. That means this prudential tools are not usually sensitive to developments in financial market and real economy. However, there had been some changes in the provisioning requirement of SME exposure since 2012. Provisioning requirement for SME exposure was reduced to 0.25% in 2012 from 2% requirement earlier, while risk weights were changed from a single slab of 75 in 2014 to three slabs of 75, 100 and 150 from 2015 depending on the size of the exposure.

TABLE 3: COUNTERCYCLICAL PRUDENTIAL REGULATION: VARIATIONS IN RISK WEIGHTS AND PROVISIONING REQUIREMENTS

Date	Capital Market Exposure		Claims fully secured by residential property		Claims fully secured by Commercial Real Estate		Retail Portfolio and Small Medium Enterprise (SME)		Consumer Finance	
	RW	Prov	RW	Prov	RW	Prov	RW	Prov	RW	Prov
Basel II										
Jan-June, 2010	125	1%	50	1%	100	1%	75	2%	100	5%
July-Dec, 2010	125	2%	50	1%	100	1%	75	2%	100	5%
Jan-June, 2011	125	2%	50	1%	100	1%	75	2%	100	5%
July-Dec, 2011	125	2%	50	1%	100	1%	75	2%	100	5%
Jan-June, 2012	125	2%	50	1%	100	1%	75	2%	100	5%
July-Dec, 2012	125	2%	50	1%	100	1%	75	0.25%	100	5%
Jan-July, 2013	125	2%	50	1%	100	1%	75	0.25%	100	5%
July-Dec, 2013	125	2%	50	1%	100	1%	75	0.25%	100	5%
Jan-July, 2014	125	2%	50	1%	100	1%	75	0.25%	100	5%
July-Dec, 2014	125	2%	50	1%	100	1%	75	0.25%	100	5%
Basel III										
Jan-July, 2015	125	2%	50	1%	100	1%	Retail 75 SE<T3mil 75 SE≥T3mil 100 ME 20 to 150	0.25%	100	5%
July-Dec, 2015	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
Jan-July, 2016	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
July-Dec, 2016	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
Jan-July, 2017	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
July-Dec, 2017	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
Jan-July, 2018	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%
July-Dec, 2018	125	2%	50	1%	100	1%	Retail 75 SE<BDT3mil 75 SE≥BDT3mil 100 ME 20 to 150	0.25%	100	5%

Notes: RW= Risk Weights in percentage, Prov.= Provision requirements, Source: Circulars and Guidelines of Bangladesh Bank

V.4 Prudential Regulation for Single Borrower Exposure

Main features of prudential regulations for limiting single borrower exposure are given below.

i) The outstanding amount of exposure, both funded and non-funded, to a single person/counterparty or a group shall not exceed 35% of the capital at any point of time.
ii) The aggregate outstanding principal amount of funded exposures shall not exceed 15% of the capital at any point of time.
iii) In case of export financing, the outstanding amount of exposure, both funded and non-funded, at any point of time to a single person/counterparty or a group shall not exceed 50% of the capital. However, the aggregate outstanding principal amount of funded exposures shall not exceed 15% of the capital at any point of time.
It was observed that same exposure limit applicable to a single borrower and a group of borrowers that were related, while also borrowers were tempted to hide their group exposure and intergroup transfer of borrowed fund making the regulation superfluous.

V.5 Risk Based Capital Adequacy under Basel III

In December 2014 BB issued revised regulatory capital adequacy framework for banks in line with Basel III and declared the road map and action plan of the phase-in arrangements for the implementation of Basel III. According to the roadmap, Basel III would phase in from January 2015 and full implementation would be completed by January 2020. Basel III reforms have both micro and macroprudential focus. The macroprudential aspects of Basel III are largely incorporated in different risk weights minimum liquidity requirement, maximum leverage and the requirement for capital buffers i.e. the capital conservation buffer and the countercyclical buffer, which are intended to protect the banking sector from periods of excess credit growth.
In the Road Map[2] for implementation of Basel III, BB introduced Countercyclical Capital Buffer (CCyB) from Jan 2016. The Guidelines for Implementation of Basel III in Bangladesh mentioned Countercyclical Capital Buffer in the overview section 1.4, but no time frame was mentioned. The main of objective of this tool was to address procyclical behavior as well as promoting countercyclical buffers for the banks with excessive credit growth. Banks in Bangladesh are currently not maintaining CCyB. The CCyB suggested

[2] BRPD circular no 07 dated March 31, 2014.

in the best practices is from 0 to 2.5% of the risk weighted assets of banks. Capital conservation buffer (CCB) would be 2.5 percent when Basel III would be fully implemented in 2019. However, it started to phase-out at incremental of 0.625 percent starting form 2016 with 0.625 percent.

Risk weights (RW) against capital market, loans to residential property or commercial real estate, loans to retail customers or SME or consumer finance remained same since the adoption of Basel II in Bangladesh. Only a little variation observed in the RW for the SME loans in Basel III framework. Though one of the important aspects of the Basel III framework is to accommodate macroprudential regulations, Basel III is being implemented in the banking system of Bangladesh without imposing any time variant RW to counter the excessive credit growth in the concerned areas. Although BB introduced Basel-III in a timely fashion, state-owned commercial banks (SCBs) have failed to maintain minimum capital adequacy requirements since 2013. Development finance institutions (DFIs) were also critically under-capitalized.

V.6 Prudential Regulations for Capital Market Exposure

According to Section 26(2) of Bank Company Act, 1991(before amendment in 2013) no banking company shall hold shares in any company exceeding the lesser of the following amounts, namely: a) 30% of the total amount of the paid-up capital and reserve of the bank company, or b) 30% of the paid-up capital of the said company. Besides, total holding of shares by any bank company shall not exceed 10% of its liabilities.

BB issued circular (BRPD Circular No.12; 29 March 2010) saying Capital Market Exposures [Claims against investor account (Merchant banking)/margin account (Brokerage house) holder] will be assigned 125% risk weight for the purpose of computing capital adequacy and these sorts of claims will not be considered for Credit Risk Mitigation (CRM).

However, BB restricted banks (DOS Circular No. 04; 15 June 2010) to participate in merchant banking (MB) and brokerage house (BH) activities without creating subsidiary companies from 1st October, 2010, while redefining capital market exposure of banks to make it broad based and imposing a new limit (10% of the total liabilities of the bank company) on capital market exposure of banks. It was the time when stock markets of Bangladesh (DSE and CSE) had been rallying irrationally. New definition of capital exposure of banks included the following:

a. Market value of shares, debentures, bonds and mutual fund purchased by banks on its own account;
b. Outstanding loan balances and credit limits to subsidiaries (merchant bank and brokerage houses);
c. Guarantee issued (100%) by banks against loans and advances taken by their subsidiaries;
d. Outstanding loans and credit limits sanctioned to any other company, institute or persons for carrying out merchant banking and brokerage house activities;
e. Loan to licensed stock market dealer against the security of shares/debentures subject to maximum limit of Taka one crore.

Besides, it was stipulated that capital market exposure would not include capital provided to the bank's own subsidiary, statutory liquid assets under Bank Company Act, Tier 1 and Tier 2 instruments issued by other banks and share in central depository (BD) limited. Furthermore, extending credit facilities to subsidiaries of a bank company or any other company or individual for carrying out merchant banking and stock brokerage activities was also subjected to single borrower exposure limit (15% of Bank Company's capital).

Considering the investment risks in the capital market BB issued a circular in October 2010 stipulating 2% general provision instead of 1% against unclassified amount of any kind of funded loan disbursed by banks to stock dealers enlisted with Stock Exchange, separate subsidiary company established by a bank company for dealing business in share brokerage and merchant banking and any other company or institution or individual for dealing such business (BRPD Circular No. 32; 27 October 2010).

Capital market of Bangladesh went through a debacle at the end of 2010. BB then relaxed its regulations step by step to give incentives to the market participants. BB extended credit limits to stockbrokers from BDT one crore to BDT three crore and allowed banks to carry on with its stock market exposures exceeding single borrower exposure limit. BB increased maximum limit to BDT three crore for loans to licensed stock market dealers against the security of shares/debentures (DOS Circular letter No. 04; 13 March 2013).

Bank Company Act, 1991 was revised in 2013 and BB issued revised policy guidelines in September 2013 (DOS Circular 02; 16 September 2013) for banks to investment in capital market. Banks were instructed to follow the maximum investment limits for individual company and for aggregate exposure as stipulated under section 26 (ka), subsection -1 of the Bank Company Act (amended up to 2013). Banks were advised to keep aggregate

capital market exposure within 25% of their capital. Banks that exceeded the aggregate capital market exposure limit were allowed to minimize their exposure limit gradually within next three years (by July, 2016). Again, in 2014, aggregate capital market exposure limit for banks on consolidated basis was revised upwards to 50% of equity capital (DOS Circular 07; 25 February 2014).

V.7 Limits on Open Foreign Currency Position

Because of the rising and comparative high foreign exchange exposures of some financial institutions, the net open position of foreign exchange on an aggregate basis has been regulated since 1990s. Initially it was set on the requirements and performance of the individual institution. From the mid of 2000s, a common benchmark had been set for all banks to indiscriminate the banks' category. This regulation aimed to help contain foreign exchange risk in the Bangladesh banking system. Under this rule, banks were required to maintain their net foreign exchange position of all currencies in aggregate not exceeding 15 percent their total eligible capital set in amount but reviews periodically. In 2016, overall open positions of banks have been revised. It was increased to the level of 20 percent of total eligible capital of individual banks with a rounded limit. With limited exposure of banks in Bangladesh to foreign borrowing and investment due to restrictions on capital account convertibility, prudential limits on foreign exchange open positions of banks worked well in containing foreign exchange risks. However, foreign exchange market of Bangladesh experienced some pressure in the exchange rate and liquidity shortage at different time periods due to demand-supply gap, which the central bank was able to smoothen.

V.8 Limits to Advance Deposit Ratio (ADR)

Since 2010, BB has been monitoring banks' advances to deposits ratio (ADR), which can be used for micro-prudential as well as macroprudential instrument. BB set ADR benchmark at 85% and 90% for conventional and Islamic banks respectively in 2016. For the best part of 2017 the private sector credit growth was on the rise, prompting the Bangladesh Bank in January, 2018 to lower the banks' advance-deposit ratio ceiling to 83.5 percent from 85 percent to be maintained by June, 2018. However, due to industry pressure it was later made effective from March 31, 2019 (DOS Circular No. 03; 09 April 2018). Such kind of regulatory forbearance could make the instrument ineffective.

Various reports of BB analyze trend of ADR for banking industry as a whole, which could be misleading as some banks with lower ADR could make the industry average

look good. If we look at individual banks, some banks could be seen breaking the maximum ADR due to aggressive lending.

V.9 Limits on Interest Rate Spread

Banks in general are free to fix their deposit and lending rate but BB advise them to reduce average spread between lending and deposit rate within lower single digit (5%). However, the maximum rate of interest rate on pre-shipment export credit is 7 percent and on agriculture loan is 12-13 percent. Banks were advised to limit the difference between weighted average lending rate and rate of interest on deposit or intermediation spread within the lower single digit in different sectors other than high risk consumer credit (including credit card) and loans to small and medium enterprises (SMEs). A constant effort of dialogue, consultation had been initiated by BB to encourage banks to limit spread at single lower digit (5%) form January 2012.

However, limits on interest rate spread cannot be termed purely as a macroprudential tool, it could be used as a monetary policy tool. Further, calculation of spread being complex, there could be temptation for banks to manipulate calculation, while it could also allow banks to increase lending rates without corresponding decrease in deposit rate making the tool ineffective.

VI. Effectiveness of Macroprudential Policy in Bangladesh

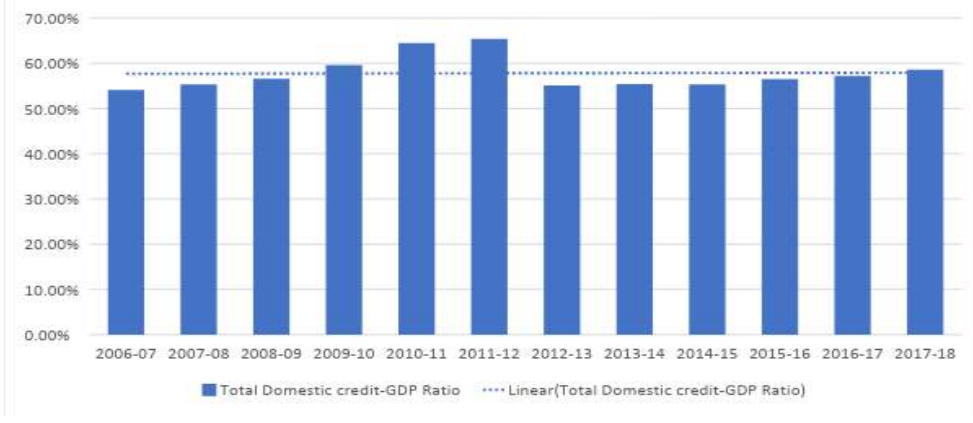
Generally, macroprudential regulations attempt to address both dimensions of systemic risk i.e., time dimension and cross-sectional dimension. The time dimension of systemic risk is closely related to pro-cyclicality of credit growth. Financial imbalances build up gradually over time when financial institutions become very aggressive in risk taking so that their leverage, liquidity, and prices of securities and real estate rise sharply in a relatively very short span of time. However, during the down-swing phase, the trend reverses triggering a fall in asset prices, resulting in devastating deleveraging and liquidity squeeze which may result in a financial crisis. On the other hand, the cross-sectional dimension is closely related to the concept of inter-connectedness of financial institutions. When an individual financial institution fails, it rapidly contaminates other institutions through various inter-linkages such as counter-party risk, asset fire sales, liquidity crisis, etc. Following analysis examined the effectiveness of macroprudential policy in containing procyclical behavior of the banking and financial sector, in other words, the time dimension of systemic risk.

VI.1 Domestic Credit to GDP Ratio, Credit Growth and Asset Price Growth

Excessive credit growth has long been recognized as integral to financial booms and busts (Minsky, 1982; Kindleberger, 2000). However, what constitutes "excessive" credit growth remains undefined. Borio and Lowe (2002a) propose a credit-to-GDP gap measured by the deviations of the credit-to-GDP ratio from a one-sided Hodrick-Prescott (HP) filter, although it may also give spurious results. Besides credit to GDP ratio and its long term trend measures of credit growth can be complemented by other indicators, for example rapid asset-price growth, and indicators of systemic risk build-up that reflect the characteristics of individual economies (FSB, IMF & BIS 2011).

Let us look at the trend of credit to GDP ratio (see Chart 2) and trend of growth in GDP, Credit and DSE Index (see Chart 3) in Bangladesh. We can see that Domestic Credit to GDP ratios exceeded the long term normal range of around 60% between 2009-10 and 2011-12, as indicated by the trend line. It was later revealed that taking opportunity of lax lending standards some unscrupulous borrowers from banks were diverting their fund into stock market. Banks were also aggressively lending and investing in capital market even going beyond the limits for capital market exposure. At the beginning of 2010, BB attempted to alert banks of growing risks in capital market exposure clarifying and redefining capital market exposure along with some additional measures. However, macroprudential regulations of BB partially contributed to check overexposure of the banking sector to capital market at the cost of a sudden crash at the end of 2010.

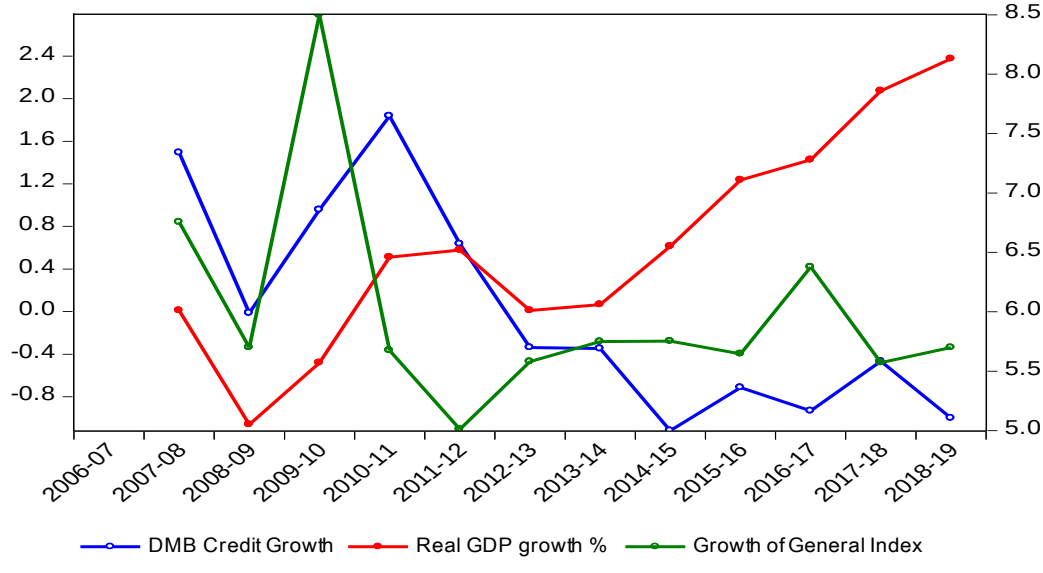
CHART 2: TOTAL DOMESTIC CREDIT-GDP RATIO %



Source: Various issues of Economic Trend, Bangladesh Bank

It can be seen from the Chart 3, GDP growth was robust (red line plotted in the right axis), while DSE General Index (green line plotted in the left axis) went through a rapid boom and bust during 2010-12. After the debacle in the capital market at the end of 2010, government and BB attempted to revive the market by giving incentives and relaxing regulations; however, the capital market never gained the confidence of the general investors and nor got back the lost ground.

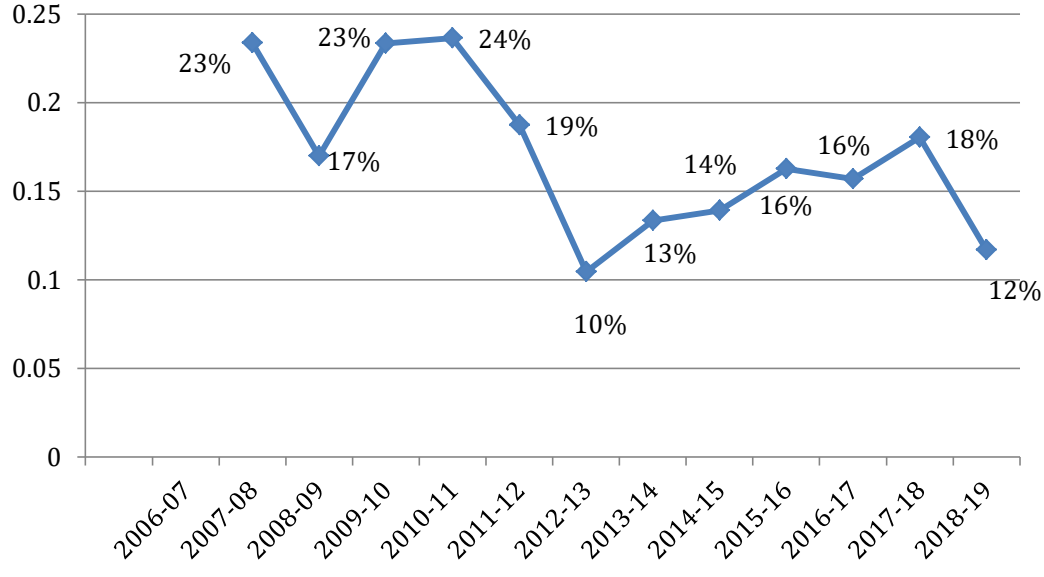
CHART 3: GROWTH IN GDP, CREDIT AND DSE INDEX



Source: Various issues of Economic Trend, Bangladesh Bank

It may be seen from the Chart 4 below, during the period of 2010-2012 DMB Advances (loans and advances provided by banks) registered a growth rate of above or close to 20%. During this period some of the biggest financial scams (such as Hallmark, Bismillah Group and BASIC Bank) in the history of Bangladesh had been unearthed.

CHART 4: GROWTH OF DMB ADVANCES



Source: Various issues of Economic Trend, Bangladesh Bank

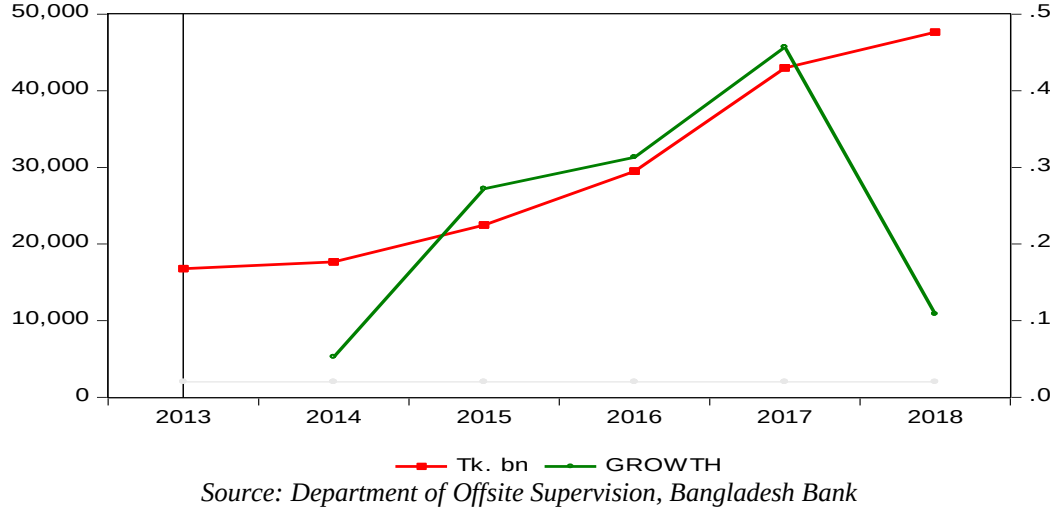
BB's prudential regulations were not so effective to rein in excessive credit growth during 2010-12. However, from 2012 onward BB pursued macroprudential policy aiming at improving corporate governance in banks and strengthening bank supervision, which partially contributed to moderating growth in overall banking sector advances subsequently.

VI.2 Consumer Finance Trend

BB's Prudential Regulations for Consumer Financing (2004) and subsequent minor revisions were basically microprudential in nature having macroprudential implication. Looking at the chart below, it can be observed that from 2015 to 2017 consumer finance by banks showed annual growth rate of around 27%, 31%, and 46% respectively, which could be termed as "excessive". During this period BB's

macroprudential policy failed to contain excessive growth in consumer credit. However, in April 2017, BB stipulated a prudential limit that consumer credit growth of banks cannot be more than their total loan growth. We can see from the chart below that consumer credit growth became "modest" at 11% in 2018. According to a newspaper report leading commercial banks provide consumer finance during 2016-17 that surpasses the growth rate of banks' total lending violating the central bank instruction. According to another report the interest rate on industrial loan was revised down to single digit after the relaxation of the cash reserve ratio in April, but consumer loan rate remained almost unchanged (*The Daily Star*, Nov.9, 2018). Banks have invested less in consumer loan to adjust the high advance deposit ratio this year, said the same report. Therefore, higher interest rate on consumer finance and ADR adjustment might be reason for modest growth in consumer finance in 2018.

CHART 5: CONSUMER FINANCE (TK BILLION)



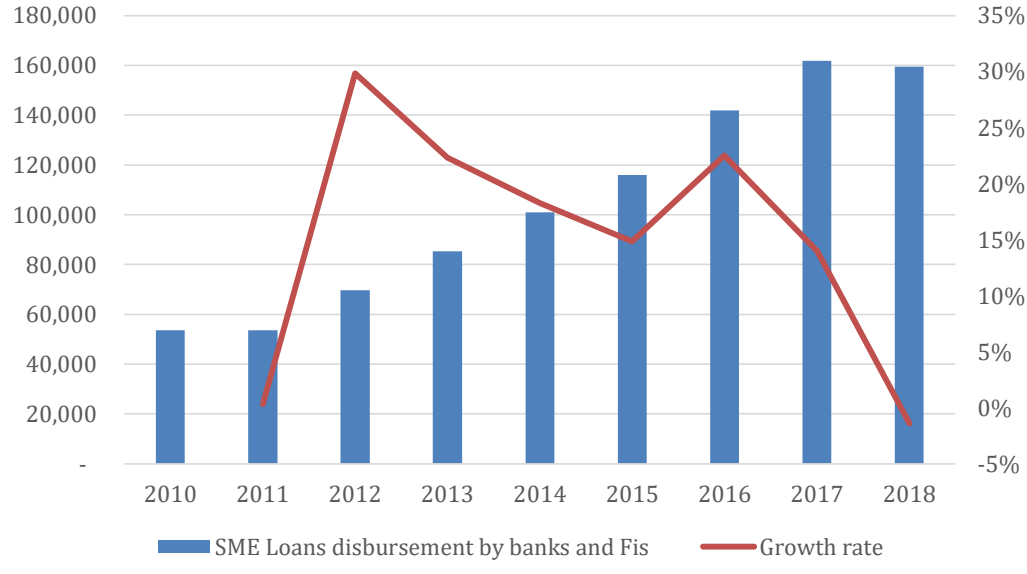
Source: Department of Offsite Supervision, Bangladesh Bank

VI.3 SME Finance Trend

Monetary policy for FY10 was designed to support highest sustainable output growth without triggering escalation of inflation, with directional bias towards credit needs of agriculture and SME sector. SME credit disbursement increased gradually from 2010, when provision requirement for unclassified SME loan was cut down from 2% to

0.25%.There was jump in growth rate of around 30% from 2011 to 2012. Thereafter, SME credit disbursement gradually increased and growth rate remained around 15-20% during 2015 to 2017.However, SME finance by banks and FIs showed a negative growth in 2018, although BB's monetary policy and prudential regulations continued to encourage SME finance, particularly for women entrepreneurs.

CHART 6: SME LOAN DISBURSEMENT BY BANKS AND FIS (TK CRORE)

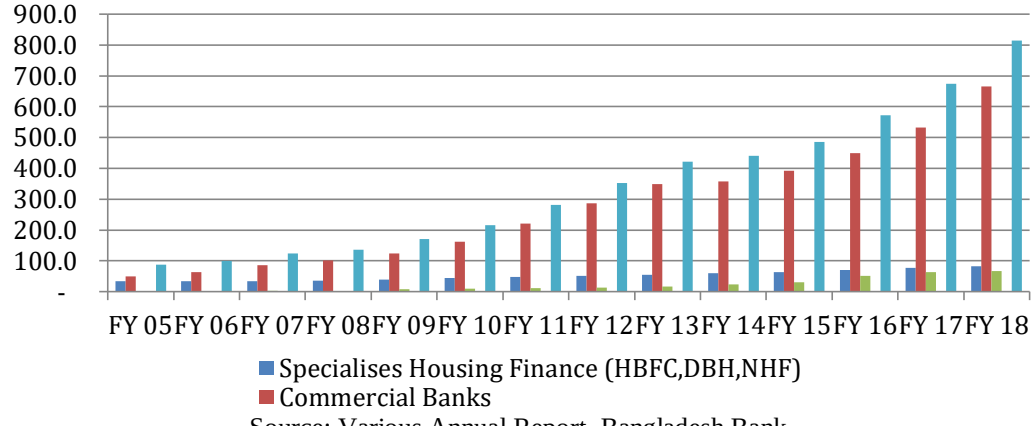


Source: SME Department, Bangladesh Bank

VI.4 Effectiveness of Macroprudential policy for Home Loan

The source of home loans currently available in Bangladesh are commercial banks, specialized housing finance institutions, other non-bank financial institutions, microcredit lenders, staff loans and informal means. Chart 7 below displays a comparison of different home loan providers during FY05 to FY18. The chart shows an upward trend of total outstanding home loans during the period with commercial banks dominating the sector with around 82% share in 2018. During the period prudential limit for home loan provided by banks was increased twice from BDT75 lac to BDT1 crore in 2010 and BDT1.2 crore in 2015; LTV was reduced from 80% to 70% in 2012, while risk weight for residential housing loan remained unchanged at 50. Some relaxations in prudential norms for residential housing loans have positive impact on growing home loan.

CHART 7: HOME LOAN (TK BILLION)



Source: Various Annual Report, Bangladesh Bank.

VI.5 Coordination between Monetary and Macroprudential Policy

According to Jiang et al (2019) monetary policy and macroprudential policy can affect bank risk-taking and asset prices through some similar channels, such as the credit channel and the balance sheet channel. Because both policies have some side effects and sometimes conflict with each other, they cannot be implemented independently.

In order to find whether there was a coordination between monetary policy and macroprudential policy, changes in the interest rates of key monetary policy instruments (particularly repo and reverse repo) and liquidity ratios (CRR, SLR) have been identified through three distinct phases during 2010-18, while changes in key macroprudential policy tools (such as ADR, provision and risk weights against sensitive assets) during the period was observed (see Table 4).

During first phase (2010-12) BB's monetary policy supported credit and output growth without triggering escalation of inflation in order to cushion the impact of global financial crisis. However, BB tightened key interest rates (repo, reverse repo, CRR and SLR) to contain inflationary pressure during 2010-12 increasing Repo rate gradually by 275 basis points and CRR, SLR 100 basis points. During this period BB increased provision against capital market exposure by 100 basis points, while reduced provision against SME credit by 175 basis points leaving other key macroprudential tools (see Table 4) unchanged.

TABLE 4: COORDINATION BETWEEN MONETARY AND MACRO PRUDENTIAL POLICIES

(Change in basis points)

Measures	**Monetary tightening phase* January 2010 to December 2012**	**Monetary accommodating phase January 2013 to December 2015**	**Monetary easing phase January 2016 to December 2018**
Monetary Measures			
Repo Rate	**+225***(+50, +25, +50,+50 and 50*)	**-50**	-125(-50 and -75)
Reverse Repo Rate	**+225***(+50, +25, +50,+50 and 50)*	**-50**	-50
CRR	+100(+50+50)	+50	-50
SLR	+100(+50+50)	0	0
Macroprudential Measures			
Loans limits			
ADR(%)-Traditional Bank ADR(%)-Islamic Bank	85 90	85 90	83.5(postponed) 89(postponed)
Interest Rate Spread (%)	5	5	4
Provision Norms			
Capital Market Exposure	+100	0	0
Exposure to residential property	0	0	0
Exposure to Commercial Real Estate	0	0	0
SME	-175	0	0
Consumer Finance	0	0	0
Risk Weights			
Capital Market Exposure	0	0	0
Exposure to residential property	0	0	0
Exposure to Commercial Real Estate	0	0	0
Retail Portfolio and SME	0	0	0
Consumer Finance	0	0	0

Notes: *ADR of 85% (Conventional banks) and 90% (Islamic banks) introduced in 2010. Spread at single lower digit (5%) form January 2012 and moral suasion in the Bankers' Meeting with the Governor of BB since late 2000s. Tightened ADR (83.5% for conventional banks and 89% for Islamic banks) will be effective from March 31, 2019*[3]*. Provisions for SME loans put down to 0.25% from July 2012 but no changes made in the RW other than for SME.*

**Monetary tightening phase was identified in terms of increase in key monetary policy rates, although otherwise it was supporting credit growth especially to agriculture and SME.*

Source: Authors' calculation and compilation

[3] DOS Circular No. 03; 09 April 2018.

During second phase (2013-2015) BB followed a balanced monetary policy approach. BB reduced repo and reverse repo rates by 50 basis points during the period, while CRR was raised by 50 basis points. During this period macroprudential tools ADR and risk weights and provision requirement for some sensitive sectors were unchanged, although efforts to improve corporate governance and risk management in the banking sector continued.

During third phase (2016-2018), BB went through monetary easing as repo rate was cut down by 125 basis points on two occasions (50 and 75 basis points), while CRR was also reduced by 50 basis points. Private sector credit grew at more than 15 percent, sometimes overshooting the monetary policy target. During this period banking sector experienced persistently higher level of non-performing loans. As of June 2018, SCBs had 28.2% NPL, which is highest in the last ten years. About 47% non-performing loans were concentrated in 5 banks as of end-June 2018 (BB, 2018). However, key macroprudential tools were unchanged during the period, while monetary policy was pursuing higher private sector credit and output growth in line with big budgetary allocation. Overall, there appears to be a lack of dynamism in adopting key macroprudential tools to counter procyclical behavior of the banking sector, while lack of effective coordination between monetary policy measures and macroprudential tools was also observed.

VII. CONCLUSION

There appears to be a lack of dynamism in adopting key macroprudential tools to counter procyclical behavior of the banking sector, while lack of effective coordination between monetary policy measures and macroprudential tools was also observed. Macroprudential regulations of BB partially contributed to check overexposure of the banking sector to capital market at the cost of a sudden crash at the end of 2010, but failed to rein in excessive credit growth during 2010-12 and consumer credit growth during 2015-17. A reduction in provision for standard SME credit in 2012, supported growth in SME credit disbursement contributing to diversifying risks in the banking sector. Some relaxations in prudential norms for residential housing loans have positive impact on growing home loan. Although BB introduced Basel-III in a timely fashion, state-owned commercial banks (SCBs) have failed to maintain minimum capital adequacy requirements since 2013. Further comprehensive research is needed in order to assess effectiveness of macroprudential tools and its coordination with monetary policy.

VIII. POLICY RECOMMENDATION

a. Make macroprudential tools such as ADR and provision against assets and risk-weights for assets under capital adequacy responsive to development in the financial system;
b. Adopt time-varying LTV ratio and dynamic provisioning system to counter procyclical behavior of the market;
c. Coordinate macroprudential policy with monetary policy,;
d. Closely monitor the compliance of macroprudential regulations and assess their impact at regular interval.

REFERENCES

Akhtaruzzaman, M. (2017). M*acro-prudential Policies and its Role in Ensuring Financial Stability*. Presentation at SAARCFINANCE Seminar, 8-9 June, 2017, Kathmandu, Nepal.

Arregui, N., Benes, J., Krznar, I., Mitra, S. & Santos, A. O. (2013). *Evaluating the Net Benefits of Macroprudential Policy: A Cookbook*, IMF Working Paper, WP/13/167.

Bangladesh Bank (2004a). *Prudential Regulations for Consumer Financing.* BRPD Circular No 7, 3rd November.

Bangladesh Bank (2004b). *Prudential Regulations for SME Financing*. BRPD Circular No. 7, 3rd November.

Bangladesh Bank (2005a). *Prudential Guidelines for Consumer Financing and Small Enterprise Financing,* BRPD Circular No. 10, 20th August

Bangladesh Bank (2005b). *Prudential Guidelines for Consumer Financing and Small Enterprise Financing,* BRPD circular No.17, 6th December.

Bangladesh Bank (2006). *Prudential Guidelines for Consumer Financing and Small Enterprise Financing,* BRPD circular No.1, 8th February.

Bangladesh Bank (2010a). *Consolidation for investment in subsidiaries and implication of other Capital Market Exposures for the purpose of computing eligible Regulatory Capital,* BRPD circular No.12, 29th March.

Bangladesh Bank (2010b). *General Provision on loan against shares etc.* BRPD Circular No. 32, 27th October

Bangladesh Bank (2010c). *Share holding and Capital Market Exposure limits for Bank-companies,* DOS Circular No. 04, 15th June.

Bangladesh Bank (2012a). *Prudential Regulations for Consumer Financing.* BRPD circular No. 3, 22nd January

Bangladesh Bank (2012b). *Prudential Regulations for Consumer Financing*, BRPD Circular No. 5, 25th April.

Bangladesh Bank (2013). *Regulation regarding investment in capital market by the scheduled banks,* DOS Circular No. 2, 16th September.

Bangladesh Bank (2017). *Prudential Regulations for Consumer Financing,* BRPD Circular No. 4, 3rd April

Bangladesh Bank (2018). *Financial Stability Report.* Various Issues.

Bangladesh Bank (2018). *Monthly Economic Trend*, Various Issues.

BIS (2010). *The term "macroprudential": origins and evolution*, BIS Quarterly Review, March

Borio, C. & Lowe, P. (2002a). *Assessing the risk of banking crises*. BIS Quarterly Review, December, pp. 43-54.

Borio, C. & Lowe, P. (2002b). *Asset prices, financial and monetary stability: exploring the nexus,* BIS Working Paper no. 114.

Boreo C. and Philip L. (2002). *Assessing the Risk of Banking Crises.*BIS Quarterly Review, December.

Bruno, V., Shim, I., & Shin, H. S. (2015). *Comparative assessment of macroprudential policies.* BIS Working Paper No. 502.

Cerutti, E., Claessens, S., & Laeven, L. (2015). *The Use and Effectiveness of Macroprudential Policies: New Evidence.*IMF Working Paper, WP/15/61.

Claessens, S., Ghosh, S. R. & Mihet, R. (2014). *Macroprudential Policies to Mitigate Financial System Vulnerabilities,* IMF Working Paper, WP/14/155.

Clement, P. (2010). *The term "macroprudential": origin and evolution.* BIS Quarterly Review, March

Erdem, F. P., Özen, E. & Ünalmış, İ. (2017). *Are Macroprudential Policies Effective Tools to Reduce Credit Growth in Emerging Markets?,* Central Bank of the Republic of Turkey Working Paper, 17/12.

FSB, IMF & BIS (2011). *Macroprudential Policy Tools and Framework.* Update to G20 Finance Ministers and Central Bank Governors, 14 February 2011.

Gómez, E., Lizarazo, A., Mendoza, J. C. & Murcia, A. (2017). *Evaluating the Impact of Macroprudential Policies on Credit Growth in Colombia,* BIS Working Paper, May.

IMF (2013).*The interaction of Monetary and Macroprudential Policies.* Washington.

IMF (2018). *Moving Forward with Macroprudential Framework.* Washington

Jiang, Y., Chong L. , Jizhou Z. & Xiaoyi Z. (2019). *Financial Stability and Sustainability under the Coordination of Monetary Policy and Macroprudential Policy: New Evidence from China*, Sustainability 2019, 11(6), 1616; March, MDPI

Kindleberger, C. P. (2000). *Manias, panics and crashes: A History of* F*inancial Crises*, expanded and revised, 4th edn., New York: John Willy

Kuttner K. & Shim, I. (2012). *Taming the Real Estate Beast: The Effects of Monetary and Macroprudential Policies on Housing Prices and Credit*. RBA Annual Conference Volume, Pp 231-259.

Lee, M., Asuncion R. C., & Kim, J. (2015). *Effectiveness of Macroprudential Policies in Developing Asia: An Empirical Analysis.*ADB Economic Working Paper Series 439. Manila: Asian Development Bank.

Lim, C., Columba F., Costa A., Kongsamut P., Otani A., Saiyid M., Wezel T., & Wu X. (2011). *Macroprudential Policy: What Instruments and How to use Them? Lessons from Country Experiences*. IMF Working Paper

Malovaná, S., & Frait J. (2016). *Monetary Policy and Macroprudential Policy: Rivals or Teammates?",* Czech National Bank Working Paper Series, No.6.

Minsky, H.P. (1982). *Financial Crises: Theory, History, and Policy*. Cambridge, England: Cambridge University Press, 1982. Pages. 13-39, in Charles P. Kindleberger and Jean-Pierre Laffargue, Eds.

Minsky, H.P. (1992). *The Financial Instability Hypothesis.* Levy Economics Institute of Bard College, Working Paper No.74.

Upper, C. (2017). *Macroprudential Framework, Implementation and Relationship with other Policies.* BIS Papers. No.94.

Verma, R. (2016). *Effectiveness of Macroprudential Policies in India.* Macroprudential Policies in SEACEN Economies. The SEACEN Centre, Malaysia.

Wang, B., & Sun T. (2013). *How Effective Are Macroprudential Policies in China?* IMF Working Paper WP/13/75.

Zhang, L. & Zoli, E. (2014). *Leaning Against the Wind: Macroprudential Policy in Asia,* IMF Working Paper, WP/14/22.

ANNEXURE 1

REFERENCE OF MONETARY AND MACRO PRUDENTIAL INSTRUMENTS AND CHANGES

1. CRR

CRR at 5.5 percent from 15 April, 2018[4].

CRR at 6.5 percent from 24 June 2014[5].

CRR at 6.0 percent from 15 December 2010[6].

CRR at 5.5 percent from 15 May 2010[7].

2. SLR

SLR at 13.0 (5.5 for Sharia'ah banks) percent from 01 February 2014[8]*(excluded CRR of 6%).*

SLR at 19.0 (11.5 for Sharia'ah banks) percent from 15 December 2010[9].

SLR at 18.5 (10.5 for Sharia'ah banks[10]*) percent from 15 May 2010*[11].

3. REPO AND REVERSE REPO RATE

Repo at 6.0 percent and Reverse Repo at 4.75 percent from 15 April 2018[12].

Repo at 6.75 percent and Reverse Repo at 4.75 percent from 14 January 2016[13].

Repo at 7.25 percent and Reverse Repo at 5.25 percent from 01February 2013[14].

Repo at 7.75 percent and Reverse Repo at 5.75 percent from 08 January 2012[15].

Repo at 7.25 percent and Reverse Repo at 5.25 percent from 05 September 2011[16].

---

[4] MPD Circular No.-01, dated April 03, 2018
[5] MPD circular No 01, dated June 23, 2014
[6] MPD circular No 04, dated December 01, 2010
[7] MPD circular No 01, dated May 04, 2010
[8] MPD circular No 02, dated December 10, 2013
[9] MPD circular No 05, dated December 01, 2010
[10] Ref: MPD116/2010-628, dated May 12, 2010
[11] MPD circular No 02, dated May 04, 2010
[12] MPD circular No 02, dated April 03, 2018
[13] MPD circular No 01, dated January 14, 2016
[14] MPD circular No 01, dated January 31, 2013
[15] MPD circular No 01, dated January 05, 2012
[16] MPD circular No 04, dated September 04, 2011

Repo at 6.75 percent and Reverse Repo at 4.75 percent from 15 June 2011[17].

Repo at 6.25 percent and Reverse Repo at 4.25 percent from 27 April 2011[18].

Repo at 6.00 percent and Reverse Repo at 4.00 percent from 13 March 2011[19].

Repo at 5.50 percent and Reverse Repo at 3.50 percent from 19 August 2010[20].

4. INTEREST SPREAD

Interest spread (IR) set at 4% instead of 5% from 30 May 2018[21].

Interest spread (IR) set at 5% (lower single digit) 19 November 2015[22].

Interest spread (IR) set at 5% (lower single digit) 22 January 2012[23].

[17] MPD circular No 03, dated June 14, 2011
[18] MPD circular No 02, dated April 26, 2011
[19] MPD circular No 01, dated March 10, 2011
[20] MPD circular No 03, dated August 19, 2010
[21] BRPD Circular Letter no. 09, dated May 30, 2018.
[22] BRPD Circular Letter no. 13 and 14, respectively dated November 19, 2015 and December 28, 2015.
[23] BRPD Circular Letter no. 01, dated January 22, 2012.

Efficiency Estimation of Private Commercial Banks in Bangladesh: Application of DEA Approach Using Panel Data

Md. ZulkarNayn[1]
Mohammad Shahriar Siddiqui[2]

Abstract

Efficiency is one the major concerns in any business setting irrespective of the nature or type of industry which it belongs. So, any company wants to achieve greater outputs with lower inputs, or to use the available inputs to the maximum. In this paper, the use of Data Envelopment Analysis (DEA) technique is illustrated in measuring the operational efficiency of the banking sector in Bangladesh, which currently has 58 scheduled banks. Out of these, 38 private commercial banks are taken into this analysis, where state-owned banks and foreign commercial banks have not been considered. Five-year panel data (2013 to 2017), collected from the secondary sources, have been used to model the efficiency of different banks. DEA has provided several efficiency measures such as technical, allocative, cost, technical and scale efficiency that explain efficiency differentials of different banks in Bangladesh. The DEA results show that Islamic banks are slightly more efficient than conventional banks. While, among the conventional banks, public conventional banks are the least efficient. The returns to scale estimation show that both conventional and Islamic banks in Bangladesh have still scope of improvement in scale efficiency. Second stage regression results also indicate that Return on Asset (ROA) have significant contribution on efficiency level of the private commercial banks. It is also revealed that first-generation banks are efficient over second, third and fourth generation banks; while second generation banks are better than third and fourth generation banks.

Keywords: Data Envelopment Analysis, Conventional Banking, Islamic Banking, Allocative, Technical, Cost, Scale, Efficiency.

JEL Classification: G21; N25.

[1]Dr. Md. Mizanur Tahman, Senior Vice President, Islami Bank Training and Research Academy, Mohammadpur, Dhaka-1207, email: mizan12bd@yahoo.com
[2] Md. Nurul Islam Sohel, Researcher, Islami Bank Training and Research Academy, Mohammadpur, Dhak-1207, email: sohelibadu15@gmail.com

1. Introduction

One of the major issues, raised in any economy especially in developing nations, is how to enhance their technical efficiency. This has led to the adoption of various economic systems and policy options throughout the history. The Bangladeshi economy in general and the banking sector is no way an exception to this phenomenon. This is more so when banks, like most other production entities are profit oriented. The efficient performance of banks can help them to compete and achieve higher rate of return relative to cost, and at the same time to participate in economic development. Inefficient performance of banks, on the other hand, will hinder economic activities in other sectors such as industry and services as banks are linked directly to the entire economy. Therefore, bank efficiency analysis is one of the vital tools for government, regulators, bank management, stock market, and investors.

Several models and approaches have been used to estimate banks' efficiency. One of them is Data Envelopment Analysis (herein after DEA) which has been used extensively to evaluate the efficiency of banking institutions, hospitals and other institutions. We execute our tests using 190 firm-year observations from 38 private commercial banks in Bangladesh for the years 2013 to 2017 by using the DEA technique. The study provides a deep understanding of the importance of maintaining the efficiency of the banking sector for sustained economic development. The paper also examines the stability of bank efficiencies over time for the studied period. The study contributes to the extant empirical literature on banking efficiency in developing countries, particularly in Bangladesh.

It will provide crucial information about Bangladeshi banks' financial conditions and management performance for the benefit to a number of interest groups and policymakers including the Bangladesh government, stock exchanges, banks managers, as well as people dealing with banks and bank stock investors. Moreover, the results of this study would provide explicit indications as to whether the Bangladeshi banks are efficient in the global financial conditions. Despite the vast number of studies that focus on the efficiency of the banking sector, to the researcher's best knowledge, only a few studies were carried out in developing countries. The majority were carried out in developed countries, with emphasis on the banking sector in the United States.

Despite the importance, there are very limited studies comparing the efficiency of Islamic and conventional banks within a country using parametric and nonparametric approach, especially in Bangladesh. Therefore, there should be a study that measures technical, allocative, cost, scale and profit efficiency of Islamic and conventional banks using modern approach in Bangladesh to provide comparison and to improve the robustness of

previous measurements. These measures could also be used as a guide for the concerned banks to recover their weakness, compete head to head with other Islamic and conventional banks, and to achieve the intended goals improving the market share.

The remainder of this study is organized as follows: section 1.1 presents the relevant literature, and section 2 is devoted to the data methodology and variable selection. Section 3 exhibits empirical results and analysis of the findings. Finally, Section 4 concludes the study with some recommendations.

1.1 Literature Review

The DEA is a non-parametric linear programming technique that measures the efficiency of decision-making units (DMUs) which use multiple inputs to produce multiple outputs and has been applied by various research communities across a wide range of industries. Concept of DEA starts by stating that Charnes (1978) in which he introduced "functional programming" in which ratios were playing very important role. That extended the single output-to-single input ratio measure of efficiency to multiple inputs and outputs without requiring recourse to a priori prescribed weights.

A good number of studies based on DEA have been found on efficiency estimation of commercial banks in different countries of across the world. For example, Zeitun & Benjelloun (2013) measured the relative efficiency of 12 Jordanian banks over the period 2005-2010 by using DEA. Constant Return to Scale (CRS) and Variable Return to Scale (VRS) were used in order to measure the relative efficiency. The result of the study showed that, on the technical efficiency scale only a few Jordanian banks were efficient in managing their financial resources and generating profit. Furthermore, few banks were found to be efficient on the scale of pure technical efficiency and only so in a few years. Most of Saudi banks had efficient financial resources by 86.17 percent and 93.97 per cent as per Charnes–Cooper–Rhodes (CCR) and Banker–Charnes–Cooper (BCR) approach respectively (Al Khathlan & Malik, 2010). Although most Syrian banks were inefficient on their operating level, they tend to be more efficient in their intermediation role (Khaddaj, 2010). Gordo (2013) estimated the 'best performing frontier' to compute for the relative efficiencies of different bank groups in the Philippines over the period 1999-2009 and found that Philippine banks have undergone technological progress, but this did not necessarily increase total factor productivity because of the decline in technical

efficiencies (TEs). Karimzadeh (2012) examined the efficiency of Indian commercial banks during 2000 – 2010 based on intermediation approach and it was revealed that Bank of India and ICICI bank are more efficient as compare to other banks in India and result confirmed that selected Public Sector Banks are more efficient than Private sectors during the study period in India. Using the DEA, Sufian and Kamarudin (2014) study the level of profit efficiency of banks in Bangladesh and found that this sector exhibits a decrease in efficiency in 2009 relative to 2004. Hence, the study suggested that the banks in Bangladesh need to improve their efficiency in order to maximize profit and shareholders' wealth. A number of later studies found the same scenario. For instance, profit efficiency of both the state-owned and the private commercial banks continue to show a decreasing trend for the post financial crisis years (e.g., Kamarudin et al. (2016)) although financial reform policies contributed in reducing banks' cost (Robin et al., 2018). Few previous studies of the efficiency of Bangladeshi Banks have been narrow in their focus. Rahman (2008) estimated branch-wise efficiency of Islami Bank Bangladesh Limited using different approaches including DEA, which was first attempt in the context of Bangladesh. Dilruba & Khandoker (2005) estimated relative economic and price efficiency of different banks in Bangladesh. This investigation estimates both technical and allocative efficiencies using different approaches for each firm in the sample, using different approaches, which covers a completely new study area to any previous study.

There are several efficiency estimation studies with special focus on the Islamic banking sub-sector across the world. For instance, Noor & Ahmad (2012) investigated the efficiency of the Islamic banking sector in 25 countries during the period 1992-2009 using data for 78 Islamic banks. The empirical findings suggest that the world Islamic banks have exhibited high pure technical efficiency. Pure technical inefficiency was found to have greater influence in determining the total technical inefficiency. Secondly, it is suggested that further analysis of the world Islamic banking sector's efficiency should consider specific factors relating to high-income countries' leading the efficiency over the years compared to banks operating in middle and low-income countries. The results showed a positive relationship between bank efficiency and size and profitability, while a negative relationship between bank efficiency and loans intensity and capitalization. A multivariate analysis based on the Tobit model reinforces these findings specifically for profitability. The return on equity had a positive but statistically insignificant relationship with bank efficiency. The finding implied that the higher the return on equity, the higher the bank productivity growth will be. Noor et al, (2011)

investigated the efficiency of the Islamic banking sectors in 4 Asian countries namely Bangladesh, Indonesia, Malaysia and Pakistan during the period of 2001-2006. The results indicated that during the period of study, although the Asian Islamic banking sectors have been operating at a relatively optimal scale of operations, they were relatively managerially inefficiency in controlling their operating costs and utilizing their resources to the fullest. Zainal & Ismail (2012) in their study examined the efficiency of Islamic banks in Malaysia in the year 2006 till 2010. The aims of the study were to calculate technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) of Islamic banks, and to compare the efficiency scores between local and foreign Islamic banks. The DEA was used to estimate the efficiency using input orientation. Inputs and outputs of this study were analyzed based on intermediation approach. The results showed that the average TE, PTE and SE were 0.79, 0.90 and 0.88 respectively. Next, local Islamic banks scored higher TE and SE compared to foreign Islamic banks. But foreign Islamic banks scored higher PTE than that of Islamic banks. Akhtar & Sadaqat (2011) investigated the impact of how the bank-specific factors of profitability affect the performance of Islamic banks of Pakistan from period 2006 to 2009. It was evident from both statistical multivariate regression models that the relationship of gearing ratio and capital adequacy ratio found to have a positive relation and are statistically significant at the 5 per cent significance level, whereas the asset management is statistically significant in model I and insignificant in model II with positive relation in both models. Size of the bank reported negative and insignificant relation in both models, which can be explained with the fact that most of the Islamic banks were facing losses in recent years. Moreover, capital adequacy found to have significant relation in both models, as prudential regulations tighten by the State bank of Pakistan.

A number of studies compared efficiency of the Islamic and conventional banks in Bangladesh, but they fail to reach in a consensus on whether the former are more efficient than the latter (or vice-versa). For instance, Nabi et al. (2019) found that the Islamic commercial banks outperform the conventional banks in technical and pure technical efficiencies though fall short in scale efficiency. Similarly, Islam and Kassim (2015) found that the Islamic banks trump over conventional banks in pure technical efficiency but they are less efficient in technical and scale efficiencies. Islam & Kassim (2015) compared the efficiency between Islamic and conventional banks in Bangladesh using the Data Envelopment Analysis covering the period from 2009 to 2013.The study finds that the Islamic banks have been pure technically efficient, but their scale efficiency is not

satisfactory, suggesting that scale inefficiency is the main source of inefficiency of the Islamic banks. In contrast, the conventional banks are found to be pure technically inefficient, but their scale efficiency is satisfactory. Islamic banks have been found to completely outperform the conventional banks in other studies (e.g., Asmild et al., 2018; Mamun et al., 2018; Rasel et al., 2018). Islamic banks have also been found as less efficient and less financially stable in other studies (e.g., Hassan, 2006; Islam et al., 2019). Mohamad et. al. (2008) examined the cost and profit efficiency of conventional versus Islamic banks using the Stochastic Frontier Approach and found that there are no significant differences between the overall efficiency results of the conventional and Islamic banks. Public conventional banks were the most efficient banks followed by private conventional and private Islamic banks with an average bias of 10 per cent (Qayyum, 2012). Moreover, the results suggest that conventional banks were more efficient compared to Islamic banks. Viverita et. al. (2007) and Kamaruddin et. al. (2008) assessed the cost and profit efficiencies of Malaysian Islamic banks and conventional banks for the period 1998 to 2004. The results suggest that an Islamic banks wasted around 30.5 per cent of its inputs relative to the best-practice bank. The results also show that there existed about 30-37 percent inefficiencies in the operations of Islamic banks over the period of study. In contrast, in a study on banks from 21 countries including Bangladesh, Bader et al. (2008) found no significant difference in overall efficiency between the Islamic and conventional banks.

However, the above studies focusing on the relative efficiency of Bangladeshi banks are very limited, and there is scarcity of research in the Bangladesh. Therefore, this study will try to fill some of this gap in the literature. In addition, it will examine the impact of bank's size, capital adequacy and length of operation on the Bangladeshi banks' efficiency.

2. Methodology and Data

2.1 Data Envelopment Analysis (DEA)

DEA, measures efficiency by solving separate Linear Programming (LP) problem for each firm. Assuming that there are N firms which produce a single output using m different inputs and the ith firm unit produces yi units of output applying xki units of kth inputs, the variable returns to scale.

DEA model for Technical Efficiency of the branch:

$$\underset{\varphi_i \omega_i}{Max} \varphi_i \qquad (1)$$

$$\varphi_i y_i + \sum_j^n \omega_j y_j - so = 0$$

Subject to:

$$-x_{ki} + \sum_{j=1}^{n} \omega_j x_{kj} + s_{I,k} = 0$$

$$\left(k = 1,2,3,.....,m \ inputs\right)$$

$$\sum_{j=1}^{n} \omega_j = 1 \ \left(j = 1,2,3,.....,n \ \ farm\,unit\right)$$

$$\omega_j \geq 0; \ so \geq 0; \ s_{I,k} \geq 0$$

Where φ_i is the proportional increase in outputs that could be obtained by the ith firm unit given input vector x_i; so and $s_{I,k}$ are the output slack and the kth input slack; and ω_i is the weight of the jth firm unit, n and m are the number of firm units and inputs, respectively?

If constraint is removed a constant return to scale (CRS) output-oriented DEA results would be estimated. Then input saving efficiency measure and output increasing efficiency measure coincide and both coincide with scale efficiency in case of VRS. The frontier level of production for firm i, denoted by:

$$y^*_i = \sum_{j=1}^{n} \omega_j y_i = \varphi_i y_i$$

The output-oriented DEA frontier maximizes the proportional increase in the output vector while remaining within the envelopment space or efficient frontier. The proportional increase in output is obtained when output slack, s_o, equals zero. The ith firm unit is efficient and lies on the frontier if $\varphi_i = 1$, $\omega_i = 1$ and $\omega_i = 0$ for $i \neq j$ and

the firm unit is inefficient and lies outside the frontier if $\varphi_i \rangle 1$, $\omega_i = 0$ and $\omega_i \neq 0$ for $j \neq i$. The output oriented technical efficiency measure of each firm, τ_i^{DEA}, can be estimated by:

$$\tau_i^{DEA} = \frac{y_i}{y^*_i} = \frac{y_i}{\varphi_i y_i} = \frac{1}{\varphi_i}$$

The estimate of technical efficiency of each firm unit in the output-oriented VRS DEA $\left(\tau_i^{VRS}\right)$ will be higher than or equal to that in the output oriented CRS DEA $\left(\tau_i^{CRS}\right)$ as the VRS DEA is more flexible than the CRS DEA.

2.2 Allocative Efficiency and Cost Efficiency

If one has price information and is willing to consider a behavioral objective, such as cost minimization, then one can measure allocative efficiencies. The allocative efficiencies are estimated minimizing following DEA problem:

$$Min_{\lambda, X_i}, w_i^{'} x_i^{+}, \qquad (2)$$

Subject to:

$$-y_i + Y\lambda \geq 0,$$

$$x_i - X\lambda \geq 0,$$

$$N1^{'}\lambda = 1,$$

$$\lambda \geq 0,$$

where w_i is a vector of input prices for the ith DMU and x_i (which is calculated by the model) is the cost-minimizing vector of input quantities for the ith DMU, given the input prices w_i and the output levels y_i. The total cost efficiency (CE) of the ith firm is calculated as:

$$CE = w_i^{'} x_i^{+} / w_i^{'} x_i^{'}. \qquad (3)$$

That is, CE is the ratio of minimum cost and observed cost for the ith firm. One can then calculate allocative efficiency (AE) using $AE = CE / TE.$

2.3 Scale Efficiency

Many studies have decomposed the TE scores obtained from a CRS DEA into two components, one due to scale inefficiency and one due to pure technical inefficiency. This may be done by conducting both a CRS and a VRS DEA upon the same data. If there is a difference in the two TE scores for a particular DMU, then this indicates that the DMU has scale inefficiency, and that the scale inefficiency can be calculated from the difference between the VRS TE score and the CRS TE score. The DEA models discussed so far have been variable returns to scale (VRS) DEA models. That is, they permit the constructed production frontier to have (local) increasing, constant or decreasing returns to scale properties. One can easily impose constant returns to scale (CRS) upon the DEA problem in problem (1) by deleting the convexity constraint $N1'\lambda = 1$. This allows calculation of the scale efficiency measure discussed below.

$$TE_{CRS} = AP_c / AP \tag{4}$$

$$TE_{VRS} = AP_v / AP \tag{5}$$

$$SE_{CRS} = AP_c / AP_V \tag{6}$$

where all of these measures are bounded by zero and one. Given this, it is clear that we can easily calculate scale efficiency (SE) as:

$$SE = TE_{CRS} / TE_{VRS} \tag{7}$$

That is, CRS technical efficiency measure is decomposed into pure technical efficiency and scale efficiency. One shortcoming of this measure of scale efficiency is that the value does not indicate whether the firm is operating in an area of increasing or decreasing returns to scale. This may be determined by running an additional DEA problem with non-increasing returns to scale (NIRS) imposed. This can be done by altering the DEA model in problem (1) by substituting the $N1'\lambda \leq 1$.

2.4 The Malmquist Productivity Index

In the presence of panel data, we can use DEA to calculate Malmquist index to measure productivity change and it can be decomposed in technological change and efficiency change. Caves et al. (1982) developed a productivity index and used the concept of distance functions in Malmquist's proportional scaling definition, without realizing the direct connection with Farrell efficiency measure.

Malmquist productivity change (Fare et al., 1985)

$$M_0^{t+1}(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^t, y^t)} \right]^{1/2} \tag{8}$$

This productivity index is the geometric mean of a pair of ratios of output distance function. The first ratio compares the performance of the data from period t to t+1 relative to production possibilities existing in period t, and the second compares the performance of the same data relative to production possibilities in period t+1.

The forgoing productivity index may be interpreted as an index of total factor productivity. It takes into account if firms are using the resources efficiency to produce goods and services, and if they are using the existing technology to produce goods and services. Values greater than one means increases in productivity, while values less than one indicate decreases in productivity over time.

Farrell et al. (1992) decomposed this index into sub-indexes measuring changes in efficiency and changes technology:

$$M_0^{t+1}\left(x^{t+1}, y^{t+1}, y^t\right) = \frac{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{D_0^{t}\left(x^t y^t\right)}\left[\frac{D_0^{t}\left(x^{t+1}, y^{t+1}\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}\frac{D_0^{t+1}\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t, y^t\right)}\right]^{1/2} \quad (9)$$

The first term of the equation is the change in technical efficiency; and the second term is the change in technology. Values greater than one means increases in output technical efficiency, values less than one mean decrease and a value of one indicates no change. The second term is the technological change.

Farrell at al. (1994) further decomposed the Malmquist index by rewriting equation (2) as:

$$M_0^{t+1}\left(x^{t+1}, y^{t+1}, x^t, y^t\right) = \underbrace{\frac{\Delta_0^{t+1}\left(x^{t+1}, y^{t+1}\right)/ D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{\Delta_0^{t}\left(x^t, y^t\right)/ D_0^{t}\left(x^t, y^t\right)}}_{\Delta ScaleEfficiency}$$

$$\underbrace{\left[\frac{D_0^{t}\left(x^{t+1}, y^{t+1}\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)} * \frac{D_0^{t}\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t, y^t\right)}\right]^{1/2}}_{\Delta PureTechnicalefficiency}$$

$$\underbrace{\left[\frac{\Delta_0^{t+1}\left(x^{t+1}, y^{t+1}\right)/ D_0^{t}\left(x^{t+1} y^{t+1}\right)}{\Delta_0^{t+1}\left(x^{t+1}, y^{t+1}\right)/ D_0^{t+1}\left(x^{t+1} y^{t+1}\right)} * \frac{\Delta_0^{t}\left(x^t, y^t\right)/ D_0^{t}\left(x^t, y^t\right)}{\Delta_0^{t+1}\left(x^t, y^t\right)/ D_0^{t+1}\left(x^t, y^t\right)}\right]^{1/2}}_{\Delta Techno\log y}$$

Where Pure Technical Efficiency * Scale Efficiency = Efficiency

Fare et al. refers the first term as a measure of change in scale efficiency and the second term as a measure of pure efficiency change. The last term is unchanged, and it gives a measure of change in technology.

Any change in scale efficiency may be caused either by i) change in the shape of the technology, ii) change in the location of the bank in the input/output space between t1 and t2, or a combination of i) and ii). Additionally, any change in the pure technical efficiency is caused by a movement of the bank relative to the existing technology. For each distance function is necessary to solve a DEA-VRS.

2.5 Determinants of Efficiency

In this study, to identify sources of inefficiency, sample banks' Return on Assets (ROA), Ratio of non-funded expense and non-funded income (NFE/NFI), generation of the banks based on year of establishment, Public or Private, Foreign or Domestic, Conventional or Islamic factors were regressed with the measured technical, Allocative and cost, scale and profit efficiency index. Second stage regression method was used to estimate the effects of those factors to the banks' efficiency.

Second stage regression

$$Y = f(X)$$

Dependent Variable:

i. Technical,
ii. Allocative,
iii. Cost, and
iv. Scale

Independent Variables:

i. Return on Assets (ROA),
ii. Ratio of non-funded expense & non-funded income (NFE/NFI),
iii. Generation of the Banks based on year of establishment,
iv. Conventional or Islamic

2.6 Sample Selection

The data needed for this empirical analysis have been taken from financial statements of conventional and Islamic banks in Bangladesh for the period 2013–2017. Out of 40 in total, 38 domestic private commercial banks are taken into this analysis. The Farmers Bank was excluded due to unavailability of data for the year 2017 and Shimanto Bank has also been excluded as it is in operation for less than five years. Public banks were dropped as objectives of the public banks are somehow different than those of private commercial banks. That is mainly profit is the objective of commercial banks while,

public banks in addition to profit earnings provide services for the people of the country on behalf of the government. Besides, recent years performances of all the public banks are poor so, considering them these efficiency analyses can influence the overall analysis and also can mislead the countries' banking efficiency performance.

Foreign banks were also dropped from the analysis as their operation in the country can be considered as a branch of international banks having main bank abroad also having branches across the world. The size, expertise and experience of these banks are much better than any domestic bank. Therefore, taking them into analysis can also hamper and mislead the performance of the domestic banks.

All 38 banks have been categorized into four: first generation (1980s), second generation (1990s), third generation (2000s) and fourth generation (2010s). Moreover, based on nature, all banks have been put into three types i.e., Islamic, conventional, and mixed (with partial Islamic banking operation through dedicated branch and window (Table 1). The complete list of the studied banks is given in the Appendix.

Table 1: Data of Studied Conventional and Islamic Banks

Generation of Bank	Type of Bank			
	Islamic	Conventional	Mixed	Total
First	2	4	3	9
Second	4	7	7	18
Third	1	1	1	3
Fourth	1	7	0	8
Total	8	19	11	38

Approach and Variables Defined

This study applied intermediation approach or asset approach developed by Sealey and Lindley (1977). Previous banking efficiency studies for Islamic and conventional banks that adopted this approach includes that of Kamaruddin et al. (2008), Bader et al. (2008), Abdul Majid et al. (2009), and Mohamed and Said (2013). The approach is also adopted due to lack of data required for implementing the production approach (Brissimis et al., 2008). In fact, the intermediation approach may be superior for assessing the profitability of financial institutions because it minimizes of total costs and not just the production costs which are an important precondition to maximize profits (Iqbal and Molyneux, 2005).

Accordingly, we assume two outputs of the private commercial banks like loan/investment (y_1) and other investment (y_2) with three inputs such as deposit (x_1), manpower (x_2), and fixed asset (x_3). The aggregate series of inputs and outputs of the banks included in this study can be read in Table 2 and Table 3.

Table-2: Mean Input and Output Variables Statistics (In Million Taka.)

Particular	2013	2014	2015	2016	2017
Manpower	2,305	2,483	2,552	2,657	2,825
Loan/Credit	86,010	100,951	117,678	138,845	167,325
Investment	27,270	31,323	33,768	34,680	34,940
Deposit	109,352	128,009	145,700	168,033	196,139
Fixed Asset	2,981	3,284	3,437	3,517	3,475
Funded Expenses	8,901	8,816	8,852	8,305	8,969
Non-Funded Expenses	3,093	3,552	3,961	4,560	5,082
Salary	1,605	1,873	2,089	2,438	2,736
Other Operating Expenses	1,488	1,679	1,873	2,122	2,346
Funded Income	11,952	12,433	12,700	12,989	14,313
Non-Funded Income	3,451	3,899	4,290	4,445	4,785

Table-3: Mean Input and Output Variables Statistics (In %)

Indicator	**2013**	**2014**	**2015**	**2016**	**2017**
Funded Expenses/Deposit	7.21	6.82	6.31	5.14	4.73
Salary/Manpower	666,758	778,502	850,552	923,500	974,713
Other Operating Expenses/Fixed Asset	76.98	84.24	91.26	101.55	112.61
Funded Expenditure/Funded Income	67.47	71.49	71.98	65.83	64.62
Non-Funded Expenses/Non-Investment Income	1,813.03	167.34	140.77	143.65	137.53
Return on Asset (ROA)	0.76	0.83	1.10	1.08	0.87

2.7 Determinants of Correlation and Regression Analysis

Bank level technical, allocative, cost, scale and profit efficiencies are ranked in descending order and a rank correlation matrix is produced. Spearman rank correlation coefficients have been estimated to examine the possible relationship among different efficiency measures.

In order to determine which factors can affect the efficiency scores, which examine some aspects of banks' structure is related to efficiency estimates. For this purpose, efficiency scores are regressed on a set of common explanatory variables like, ROA, NFE/NFI, bank type (Islamic, conventional, Mixed), and bank generation (First, Second, Third, Fourth).

In this study, to identify sources of inefficiency, sample banks' Return on Assets (ROA), Ratio of non-funded expense and non-funded income (NFE/NFI), generation of the banks based on year of establishment, conventional or Islamic factors were regressed with the measured technical, Allocative and cost, and scale efficiency index. Second stage regression method was used to estimate the effects of those factors to the banks' efficiency.

3 Results and Discussion

The efficiency of conventional and Islamic banks in Bangladesh is measured by applying non-parametric DEA methods. To make a comparable measurement, conventional and Islamic banks are pooled together annually to form a common frontier. All banks for each year (2013 – 2017) are pooled to measure efficiency.

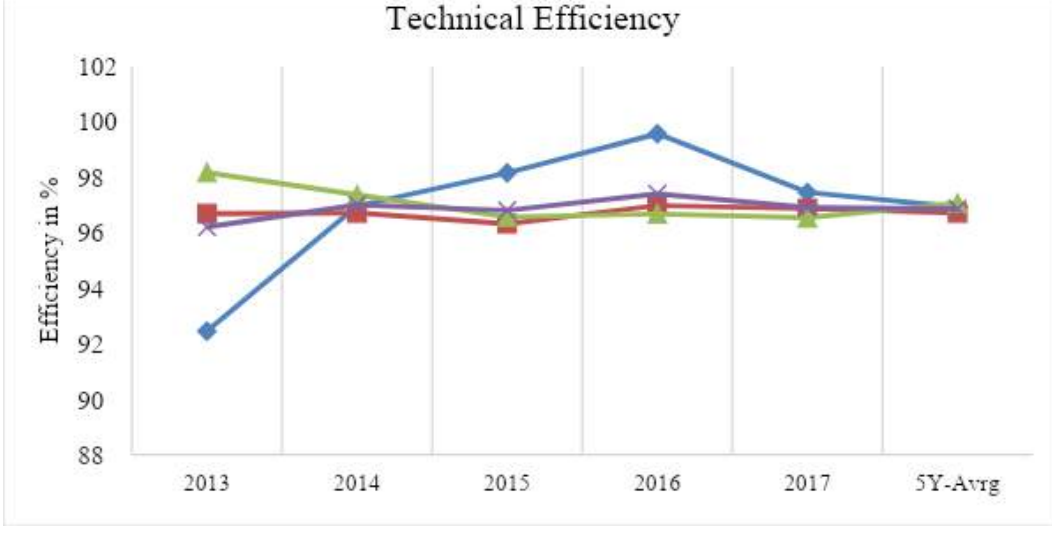
3.1 Efficiency Estimation using Different Models

Efficiency estimated different models are presented in the following sub-sections.

3.1.1 DEA Technical Efficiency

The mean technical efficiency, estimated using DEA approach, in Figure 3 shows that during the study period (2013-2017), the mixed banks turn out to be the most efficient (97.1) while Islamic (96.9) and conventional (96.7).

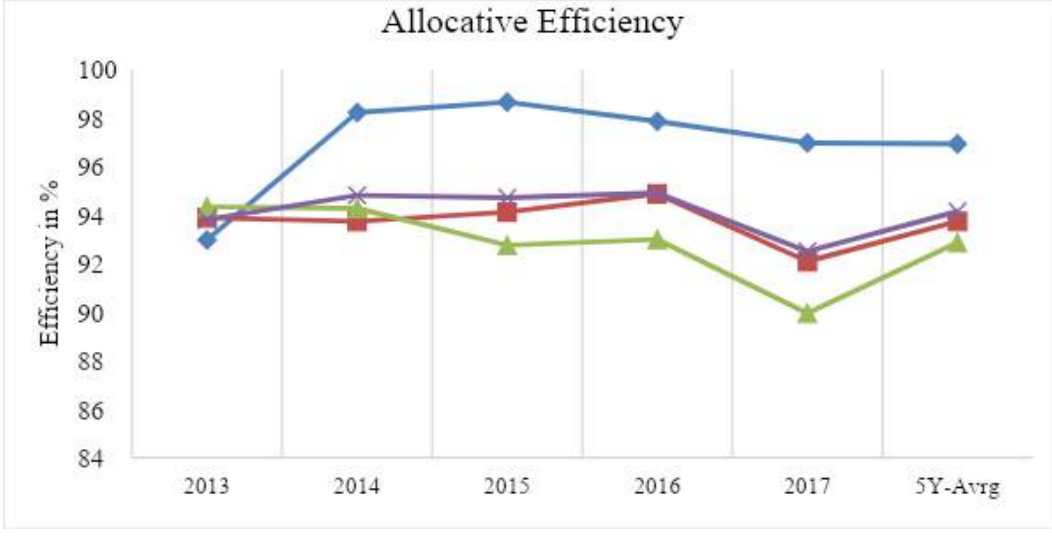
Figure 3: Technical Efficiency of Commercial Banks in Bangladesh (2013-17)



3.1.2 DEA Allocative Efficiency

The allocative efficiency estimation shows (Figure 4) that during the study period (2013-2017) on average Islamic banks have become more allocative efficient (96.9), followed by conventional banks (93.7), mixed banks (92.9) and all PCBs (94.1).

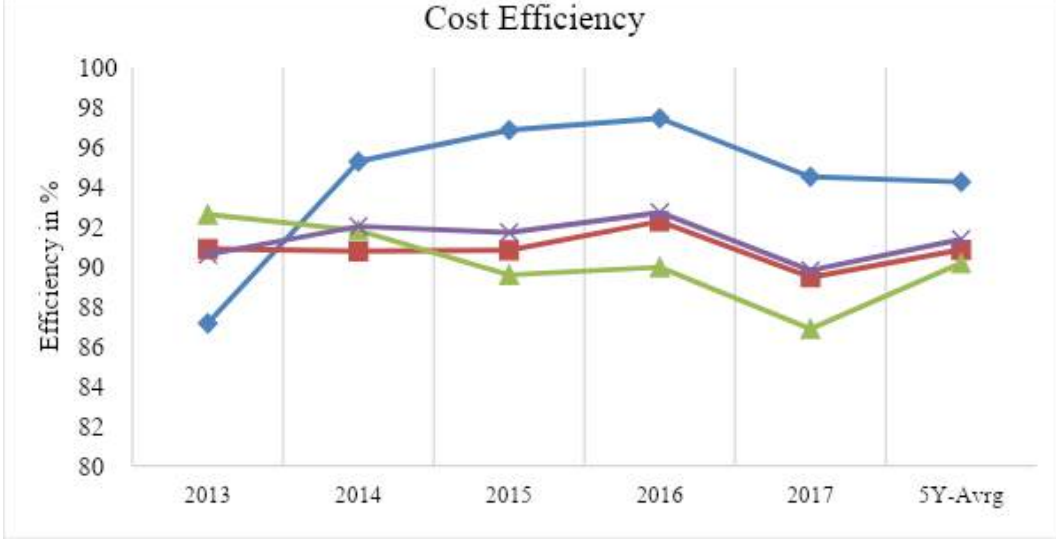
Figure 4: Allocative Efficiency of Commercial Banks in Bangladesh (2013-17)



3.1.3 DEA Cost Efficiency

The mean cost efficiency results show (Figure 5) that Islamic banks have been comparatively the most cost efficient private commercial banks (94.2) followed by conventional private commercial banks (90.8), mixed banks being the least cost efficient (90.2) and all PCBs (91.4).

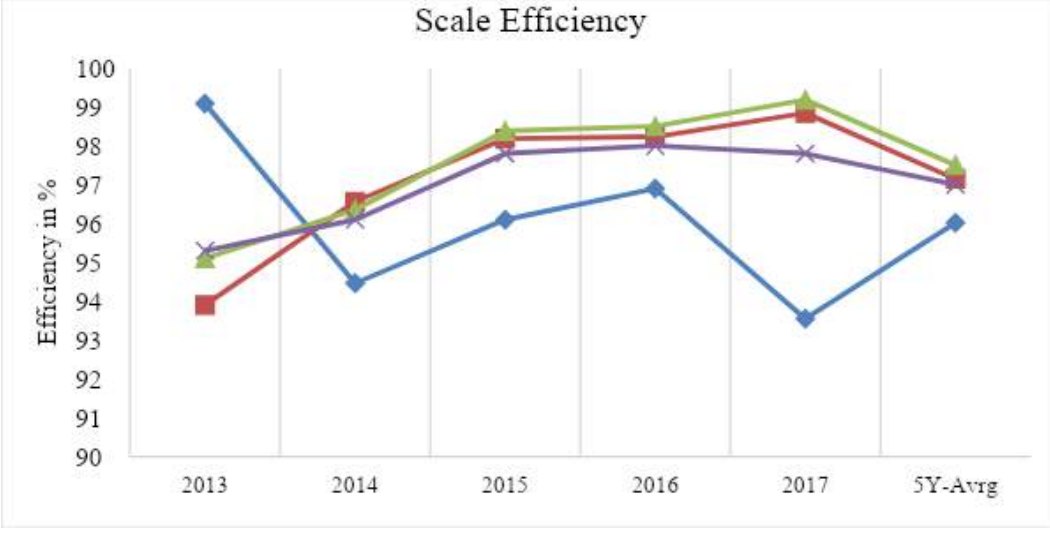
Figure 5: Cost Efficiency of Commercial Banks in Bangladesh (2013-17)



3.1.4 DEA Scale Efficiency

Group-wise mean scale efficiency results show (Figure 6) that mixed banks have become the most scale efficient (97.5) which was followed by conventional banks (97.1) and Islamic banks (96.0). The scale efficiency of all PCBs is (97.0).

Figure 6: Scale Efficiency of Commercial Banks in Bangladesh (2013-17)

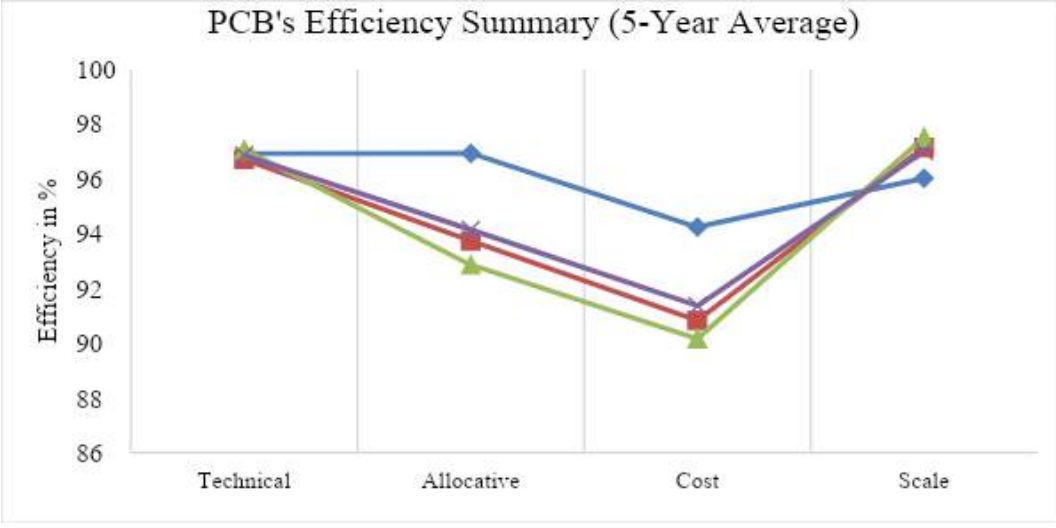


3.1.5 Summary of DEA Efficiency of Different Banks

The study shows that all Bangladeshi banks are relative less cost efficient. Islamic banks are comparatively better cost and allocative efficient than conventional counterpart. The average technical and scale efficiency of all banks is almost similar, while likewise technical efficiency scale efficiency of the all banks are almost similar. This means that the dominant source of inefficiency all banks are due to allocative inefficiency and cost inefficiency rather than technical inefficiency. Similar results are observed for conventional banks as well.

Figure 7: Summary of Efficiency of Private Commercial Banks in Bangladesh (2013-17)

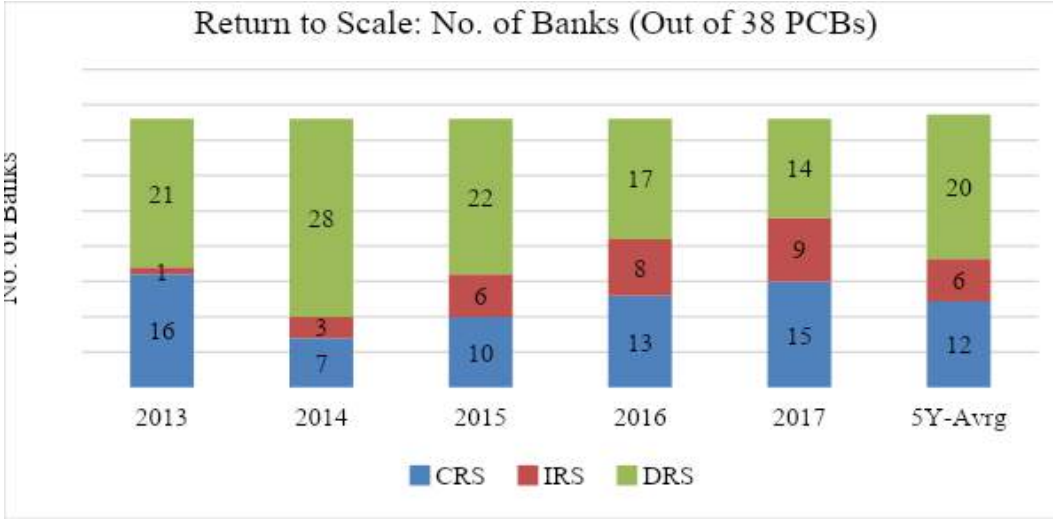
3.2 Return to Scale of Private Commercial Banks in Bangladesh



The scale efficiency of banks can be viewed from the trend of the return to scale (RTS) measured by DEA. Scale efficient banks exhibit constant return to scale (CRS). Banks experiencing economies of scale exhibit increasing return to scale (IRS), which means that the bank operates at a wrong scale of operation. Banks experiencing diseconomies of scale exhibit decreasing return to scale (DRS).

Figure 8 shows that most of the PCBs (on average 20) in Bangladesh are operating at diseconomies of scale (DRS), 12 banks on CRS and 6 banks on IRS during the study period. However, more and more banks are heading toward CRS and IRS.

Figure 8: Return to Scale of Commercial Banks in Bangladesh (2013-17)



Five out of 8 Islamic Banks are running at DRS, 2 at CRS and one 1 at IRS. Out of 19 conventional banks 10 banks are operating at DRS, 6 at CRS and 3 at IRS. On the other hand, 5 at DRS, 4 at CRS and 1 at IRS among 11 mixed banks (Table 4).

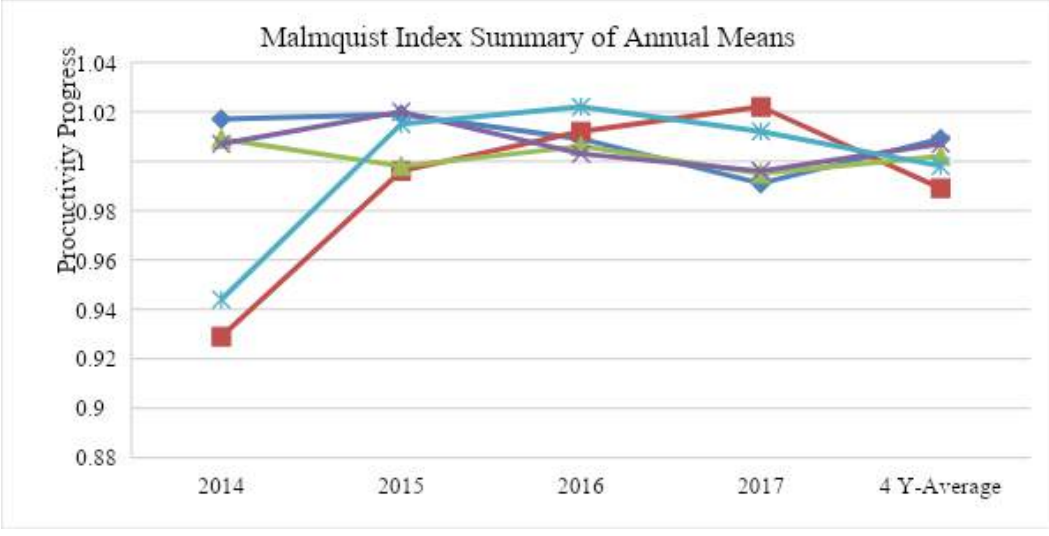
Table 4: Return to Scale: Commercial Banks of Bangladesh

Return to Scale (No. of banks)																		
Scale	Islamic Banks (8)						Conventional Banks (19)						Mixed Banks (11)					
	'13	'14	'15	'16	'17	5Y-Avrg	'13	'14	'15	'16	'17	5Y-Avrg	'13	'14	'15	'16	'17	5Y-Avrg
CRS	5	1	0	2	1	2	6	3	5	8	7	6	5	3	5	3	7	4
IRS	1	1	3	2	1	1	0	2	3	4	6	3	0	0	0	2	2	1
DRS	2	6	5	4	6	5	13	14	11	7	6	10	6	8	6	6	2	5

3.3 Productivity Progress

The chart below reports results from measuring productivity progress of different banks (Figure 9 and Figure 10). The results indicate that the studied banks have experienced only 2.2 per cent productivity growth over the sample period. It is worth mentioning that productivity changes reflect the product of changes in technical and technological efficiency. According to the study findings, banks in Bangladesh have been able to achieve such productivity improvement from becoming more technologically advanced than from being more technically efficient.

Figure 9: Malmquist Index Summary of Annual Means (Output Oriented Malmquist DEA)



Tfpch = change in total factor productivity (Malmquist index of productivity); effch = Change in technical efficiency; techch = Change in Technology; pech = Change in Pure technical efficiency; sech = Change in Scale Efficiency

3.4 Spearman rank order correlation coefficients

Cardinal comparisons are probably not possible given the different assumptions of various methodologies. Therefore, Bank level technical, allocative, cost, scale and profit efficiencies are ranked in descending order and a rank correlation matrix is produced. Spearman rank correlation coefficients were estimated to examine the possible relationship among different efficiency measures is reported in Table 5. The null hypothesis is that correlation coefficient between two variables is zero. As the results indicate, the Spearman correlation coefficients are all significantly different to zero, indicating that there is a strong association amongst efficiencies. Most of the rank correlations are positive and significant. Results on a bivariate basis turn out to be high enough to conclude that the ranking of banks across different frontier approaches remains largely unchanged.

Table 5: Spearman rank order (s) correlation coefficients among efficiency estimates and proxy-measured of performance

Efficiency	Technical	Allocative	Cost	Scale
Technical	1.000	.543**	.767**	.157*
Allocative	.543**	1.000	.938**	.142
Cost	.767**	.938**	1.000	.154*
Scale	.157*	.142	.154*	1.000

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

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

3.5 Second-Stage Regression

Table 6 reports the results of the regression estimation. It is important to note that dependent variables are the DEA efficiency scores. The results suggest that the positive sign of the ROA and NFE/NFI coefficients signals that higher efficiency is correlated with higher profitability. Second stage regression results also indicate that ROA, FE/FI and NFE/NFI have significant positive relation on the efficiency of the banks. Results also show that first generation banks are generally slightly better than all other three generation banks, though second-generation banks are also doing well. Islamic banks overall efficiency levels are comparatively better than conventional banks though not significant.

Table 6: Second-Stage Regression Results

Reference	Variable	TE	AE	CE	SE
	R Square	0.505	0.659	0.624	0.622
	Constant	.912 (.000)	.762 (.000)	.705 (.000)	.976 (.000)
	Funded Expenditure/Funded Income	.173 (.032)	.604 (.000)	.486 (.000)	-.052 (.475)
	Non-Funded Expenditure/Non-Funded Income	.196 (.008)	.180 (.005)	.211 (.002)	-.016 (.806)
	Return on Assets	.626 (.000)	.591 (000)	.639 (.000)	.122 (.173)
First Generation	Second Generation	-.211 (.016)	-.258 (.001)	-.274 (.001)	.319 (.000)

	Third Generation	-.128 (.085)	-.100 (.122)	-.139 (.038)	.063 (.348)
	Fourth Generation	-.021 (.818)	-.007 (.929)	-.007 (.935)	.235 (.006)
Islamic	Conventional	-.157 (.177)	-.057 (.575)	-136 (.196)	.040 (.707)
	Mixed	-.005 (.964)	-.117 (.225)	-.120 (.233)	.130 (.198)

Note: TE: Technical Efficiency, AE: Allocative Efficiency CE: Cost Efficiency, SE: Scale Efficiency, ROA is return on assets (Net income/Total assets) and NFE/NFI is the ratio of non-funded expenditure and non-funded income.

*** Significant at the 0.01 level; ** Significant at the 0.05 level; * Significant at the 0.10 level

4 Conclusion

The paper investigates the relative efficiency of the Private Commercial Banks (PCBs) under subgroups of Islamic, conventional, and mixed in Bangladesh employing a panel data during 2013 to 2017. Out of the 58 banks of the country only 38 banks are taken into analysis, dropping the public and foreign banks working in the country. Non-parametric DEA technique is used to examine efficiency of these banks. The study shows that overall cost efficiency (CE) estimates of all PCBs are relatively less cost efficient. Islamic banks are also relatively less efficient in containing cost, though comparatively better cost efficient than conventional counterpart. Islamic banks are relatively efficient in allocating resources. The average technical and scale efficiency of all these banks is almost similar. This means that the dominant source of inefficiency all banks are due to allocative inefficiency and cost inefficiency rather than technical inefficiency. Similar results are observed for conventional banks as well.

Overall, using non-parametric DEA method, Islamic private banks are slightly more efficient than conventional banks in two measures (allocative and cost efficiencies) during the period of study, while technical and scale efficiencies are very similar for all banks. This can be attributed, among others, to efficient financing activities.

Productivity progress analysis indicates that there has been moderate increase in productivity growth over the years. Productivity increase in banking industry is mainly driven by technological change (opening and penetrating in other markets) not technical efficiency change, i.e., efforts of inefficient banks to catch up with the efficient ones).

Second stage regression results indicate that Return on Assets (ROA) of the banks have significant contribution on banks efficiencies. Though not significant but Islamic banks

are still have been performing better than their conventional counterparts. Islamic and Conventional banks show a convergence in the characteristics of inputs and outputs, where income has become the most efficient element, while labor or human resource should be given top priority for improvements. Income from banking services have come from sophisticated diverse banking services provided by conventional and Islamic banks, such as e-banking, internet-banking, online banking, phone-banking, sms-banking, and so on. Conversely, labour has always been inefficient part of conventional and Islamic banks. This could be attributed to the nature of service industry where the most important capital is skilled and experienced human capital. Moreover, in Islamic banking, the supply of human resource is always lagging the demand of this still fast-growing industry.

The findings of this study are expected to contribute to the existing knowledge on the operating performance of the commercial banking industry in Bangladesh. The study has also provided further insight to bank specific management as well as the policymakers about attaining optimal utilization of capacities, improvement in managerial expertise, efficient allocation of scarce resources and most productive scale of operation of the PCBs. This may also facilitate directions for sustainable competitiveness of future banking operations in Bangladesh.

References

Ahmad, N. H., & Noor, M. A. N. M. (2011). The determinants efficiency and profitability of world Islamic banks. In *2010 International Conference on E-business, Management and Economics* (Vol. 3).

Akhtar, M. F., Ali, K., & Sadaqat, S. (2011). Performance efficiency of commercial banks of Pakistan: Nonparametric technique data envelopment analysis (DEA). *Asian Journal of Business and Management Sciences*, *1*(2), 150-156.

AlKhathlan, K., & Malik, S. A. (2010). Are Saudi banks efficient? Evidence using data envelopment analysis (DEA). *International journal of economics and finance*, *2*(2), 53-58.

Asmild, M., Kronborg, D., Mahbub, T., & Matthews, K. (2018). The efficiency patterns of Islamic banks during the global financial crisis: The case of Bangladesh. *The Quarterly Review of Economics and Finance*. Advance online publication. Available at: https://doi.org/10.1016/j.qref.2018.04.004.

Bader, M., Shamsher, M., Ariff, M., & Hasan, T. (2008). Cost, Revenue, and Profit Efficiency of Islamic versus Conventional Banks: International Evidence using Data Envelopment Analysis. *Islamic Economic Studies.* Vol.15, No.2.

Brissimis, S. N., Delis, M. D. & Papanikolaou, N. I. (2008). Exploring the nexus between banking sector reform and performance: evidence from newly acceded EU countries. Bank of Greece. *Working paper*, Economic Research Department - Special Studies Division. pp. 1-38.

Dilruba, K., & Khandoker, S. H. (2005). X-Efficiency Analysis of Problem Banks of Bangladesh), *Pakistan Journal of Social Science*, 3/3.

Gordo, G. (2013). Estimating Philippine bank efficiencies using frontier analysis. *Philippine Management Review, 20*.

Hasan, Z. (2007). "Evaluation of Islamic Banking Performance: On the Current Use of Econometric Models," in Iqbal, Nunawar, Salman Syed Ali and Dadang Muljawan (eds). Advances in Islamic Economics and Finance, Vol.1, Islamic Research and Training Institute, Islamic Development Bank, Jeddah, Saudi Arabia.

Hasan, M. K. (2003). "Cost, Profit and X-Efficiency of Islamic Banks in Pakistan, Iran and Sudan," *Paper*, International Conference on Islamic Banking: Risk Management, Regulation and Supervision, Bank Indonesia – Islamic Research and Training Institute, Jakarta, 30 September – 20 October 2003.

Hasan, M. K. (2006). The X-Efficiency in Islamic Banks. *Islamic Economic Studies*, Vol.13, No.2.

Islam, S., & Kassim, S. (2015) "Efficiency of Islamic and Conventional Banks in Bangladesh: Comparative Study Using DEA Approach", *Journal of Islamic Economics, Banking and Finance*, Vol. 11 No. 3, July-September, pp 83-110

Iqbal, M. & Molyneux, P. (2005). Thirty years of Islamic banking: history, performance and prospects. *New York: Palgrave Macmillan*.

Kamaruddin, B. H., Safa, M.S., & Mohd, R. (2008). Assessing production efficiency of Islamic banks and conventional bank Islamic windows in Malaysia. *Working Paper (10670)*, MPRA.

Kamarudin, F., Sufian, F., & Nassir, A.M. (2016). Global financial crisis, ownership and bank profit efficiency in the Bangladesh's state owned and private commercial banks. Contaduría y Administración, 61(4): 705-745. Available at: https://doi.org/10.1016/j.cya.2016.07.006.

Karimzadeh, M. (2012). Efficiency analysis by using Data Envelop Analysis model: evidence from Indian banks. *International Journal of Latest Trends in Finance and Economic Sciences*, *2*(3), 228-237.

Khaddaj, W. W. (2010). Evaluating banks efficiency in Syria: An empirical study using Data Envelopment Analysis. *Available at SSRN 1876475*.

Mamun, S.A., Musa, S.M. & Islam, M.A. (2018). Comparative analysis of financial performance of conventional banks and islamic banks. *Journal of Knowledge Globalization*, 10(2): 67-89.

Nabi, M.G., Islam, M.A. & Bakar, R. (2019). Do private commercial banks outperform state-owned commercial banks? Empirical evidence from Bangladesh. *Journal of Applied Finance and Banking*, 9(5): 167-186.

Noor, M. A. N. M., & Ahmad, N. H. B. (2012). The determinants of Islamic banks' efficiency changes: Empirical evidence from the world banking sectors. *Global Business Review*, *13*(2), 179-200.

Qayyum, A., & Riaz, K. (2012). Technical efficiency of Pakistani banks: An application of bootstrapped data envelopment analysis approach. *World Applied Sciences Journal*, *16*(12), 1837-1845.

Rahman, M. M. (2011). Different Parametric and Non-parametric Approaches to Model the Efficiency of Islamic and Conventional Banks in Bangladesh. *International Journal of Business & Management Science*, *4*(2).

Rasel, M., Anusara, J., Chanthamith, B., & Sultana, A. (2018). Islamic banking and finance in Bangladesh: Potential, challenges and future development. *American Journal of Business*, 6(4): 119-126.

Robin, I., Salim, R., & Bloch, H. (2018). Cost efficiency in Bangladesh banking: Does financial reform matter? *Applied Economics*, 50(8): 891-904. Available at: https://doi.org/10.1080/00036846.2017.1346361.

Sealey, C., & Lindley, J. T. (1977). Inputs, outputs and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32(4) (1977), pp. 1251-1266.

Sufian, F. (2006). The Efficiency of Islamic Banking Industry: A Non-Parametric Analysis with Non-discretionary Input Variable. *Islamic Economic Studies*, Vol.14, No.1&2.

Sufian, F. & Kamarudin, F. (2014). Efficiency of the Bangladesh banking sector: Evidence from the profit function. *Jindal Journal of Business Research*, 2(1): 43-57.

Viverita, K. B., & Skully, M. (2007). Efficiency analysis of Islamic banks in Africa, Asia and the Middle East. *Review of Islamic Economics*, *11*(2), 5-16.

Zainal, N. S., & Ismail, M. (2012, March). Islamic banking efficiency: A DEA approach. In *3rd International Conference on Business and Economic Research (3rd ICBER). http://www. internationalconference. com.y/proceeding/3rd_icber2012_proceeding/136_388_3rdICBER2012_Proceeding_PG1952 _1965. pdf*.

Zeitun, R., & Benjelloun, H. (2012). The Efficiency of Banks and Financial Crisis in a Developing Economy: The Case of Jordan. *International Review of Accounting, Banking & Finance*, *4*(2).

Appendices

Appendix A: Scale Efficiency of PCBs

Bank	Type	Generation	2013	2014	2015	2016	2017	5Y-Avrg	Rank
Al-Arafah Islami Bank Ltd	Islamic	Second	0.995	0.996	0.994	0.948	0.973	0.981	20
EXIM Bank Ltd	Islamic	Second	1	1	0.992	1	0.955	0.989	16
First Security Islami Bank Ltd	Islamic	Second	1	0.993	0.952	0.949	0.946	0.968	27
ICB Islamic Bank Ltd	Islamic	First	0.982	0.645	0.857	0.93	0.656	0.814	38
Islami Bank Bangladesh Ltd	Islamic	First	0.95	0.931	0.905	0.942	0.961	0.938	34
Shahjalal Islami Bank Ltd	Islamic	Third	1	0.995	0.999	0.999	1	0.999	4
Social Islami Bank Ltd	Islamic	Second	1	0.998	0.999	0.984	0.998	0.996	10
Union Bank Ltd	Islamic	Fourth	1	0.999	0.99	1	0.995	0.997	8
AB Bank Ltd	Mixed	First	1	1	1	1	1	1.000	1
BD Commerce	Conventional	Second	0.894	0.951	1	1	1	0.969	25
Bank Asia Ltd	Mixed	Second	0.997	0.976	1	1	1	0.995	11
BRAC Bank Ltd	Conventional	Third	0.949	0.919	0.974	0.988	0.968	0.960	30
Dhaka Bank Ltd	Mixed	Second	1	0.994	0.998	0.996	1	0.998	7
Dutch-Bangla Bank Ltd	Conventional	Second	0.896	0.916	0.968	0.982	1	0.952	33
Eastern Bank Ltd	Conventional	Second	0.909	0.99	0.981	0.992	1	0.974	24
IFIC Bank Ltd	Conventional	First	0.909	0.954	0.988	0.993	0.999	0.969	26
Jamuna Bank Ltd	Mixed	Third	0.832	0.838	0.95	0.989	0.999	0.922	36
Meghna Bank Ltd	Conventional	Fourth	1	1	1	0.977	0.943	0.984	18
Mercantile Bank Ltd	Conventional	Second	0.963	0.979	0.981	1	1	0.985	17
Midland Bank Ltd	Conventional	Fourth	0.966	1	1	1	1	0.993	12
Modhumoti Bank Ltd	Conventional	Fourth	1	1	1	1	0.996	0.999	3
Mutual Trust Bank Ltd	Conventional	Second	0.924	0.982	0.984	0.99	0.999	0.976	23
National Bank Ltd	Conventional	First	0.93	0.981	0.997	1	1	0.982	19
National Credit & Commerce Bank Ltd	Conventional	Second	1	0.985	1	1	0.999	0.997	8
NRB Bank Ltd	Conventional	Fourth	1	0.986	0.992	1	0.97	0.990	15
NRB Commercial Bank Ltd	Conventional	Fourth	0.95	0.959	0.996	0.992	1	0.979	22
NRB Global Bank Ltd	Conventional	Fourth	1	0.998	0.994	0.974	0.999	0.993	13
One Bank Ltd	Conventional	Second	1	0.999	0.999	1	0.995	0.999	4
Premier Bank Ltd	Mixed	Second	0.923	0.955	0.99	0.987	0.984	0.968	28

Prime Bank Ltd	Mixed	Second	0.942	0.935	0.94	0.974	1	0.958	31
Pubali Bank Ltd	Mixed	First	0.876	0.93	0.963	0.935	0.936	0.928	35
South Bangla Agriculture	Conventional	Fourth	0.93	0.996	0.995	0.988	0.994	0.981	21
Southeast Bank Ltd	Mixed	Second	1	1	1	0.972	0.991	0.993	14
Standard Bank Ltd	Mixed	Second	1	0.993	1	0.997	1	0.998	6
The City Bank Ltd	Mixed	First	0.892	0.978	0.981	0.985	1	0.967	29
Trust Bank Limited	Mixed	Second	1	1	1	1	1	1.000	1
United Commercial Bank Ltd	Conventional	First	0.945	0.964	0.965	0.924	0.987	0.957	32
Uttara Bank Ltd	Conventional	First	0.677	0.788	0.841	0.864	0.931	0.820	37
38 PCBs			**0.953**	**0.961**	**0.978**	**0.98**	**0.978**	**0.970**	

Appendix B: Technical Efficiency of PCBs

Bank	Type	Generation	2013	2014	2015	2016	2017	5Y-Avrg	Rank
Al-Arafah Islami Bank Ltd	Islamic	Second	1	0.952	1	1	0.935	0.977	17
EXIM Bank Ltd	Islamic	Second	1	1	0.978	1	0.999	0.995	11
First Security Islami Bank Ltd	Islamic	Second	0.897	0.937	0.974	1	1	0.962	25
ICB Islamic Bank Ltd	Islamic	First	0.65	1	1	1	1	0.930	35
Islami Bank Bangladesh Ltd	Islamic	First	1	1	1	1	1	1.000	1
Shahjalal Islami Bank Ltd	Islamic	Third	0.931	0.97	0.961	0.965	0.972	0.960	26
Social Islami Bank Ltd	Islamic	Second	0.918	0.938	0.972	1	0.941	0.954	28
Union Bank Ltd	Islamic	Fourth	1	0.96	0.967	1	0.949	0.975	18
AB Bank Ltd	Mixed	First	1	1	1	1	1	1.000	1
BD Commerce Bank	Conventional	Second	0.875	0.996	1	1	1	0.974	19
Bank Asia Ltd	Mixed	Second	0.978	0.994	1	1	1	0.994	13
BRAC Bank Ltd	Conventional	Third	0.942	0.983	0.971	0.959	1	0.971	20
Dhaka Bank Ltd	Mixed	Second	1	0.904	0.933	0.923	0.906	0.933	33
Dutch-Bangla Bank Ltd	Conventional	Second	0.858	0.873	0.863	0.852	0.856	0.860	38
Eastern Bank Ltd	Conventional	Second	0.973	0.973	0.952	0.948	0.948	0.959	27
IFIC Bank Ltd	Conventional	First	0.978	0.945	0.925	0.923	0.96	0.946	30
Jamuna Bank Ltd	Mixed	Third	0.954	1	0.929	0.936	0.917	0.947	29
Meghna Bank Ltd	Conventional	Fourth	1	1	1	1	1	1.000	1
Mercantile Bank Ltd	Conventional	Second	0.97	0.98	0.996	1	1	0.989	15
Midland Bank Ltd	Conventional	Fourth	0.979	1	1	1	1	0.996	10

Modhumoti Bank Ltd	Conventional	Fourth	1	1	1	1	0.994	0.999	8
Mutual Trust Bank Ltd	Conventional	Second	0.882	0.892	0.903	0.903	0.912	0.898	37
National Bank Ltd	Conventional	First	1	1	1	1	1	1.000	1
National Credit & Commerce	Conventional	Second	1	1	1	1	0.974	0.995	12
NRB Bank Ltd	Conventional	Fourth	1	1	1	1	1	1.000	1
NRB Commercial Bank Ltd	Conventional	Fourth	1	0.975	0.963	1	1	0.988	16
NRB Global Bank Ltd	Conventional	Fourth	1	0.893	0.903	0.931	0.905	0.926	36
One Bank Ltd	Conventional	Second	0.989	1	0.949	0.951	0.954	0.969	22
Premier Bank Ltd	Mixed	Second	0.914	0.924	0.919	0.962	0.939	0.932	34
Prime Bank Ltd	Mixed	Second	1	1	1	0.976	0.979	0.991	14
Pubali Bank Ltd	Mixed	First	0.957	0.957	0.919	0.994	1	0.965	23
South Bangla Agriculture	Conventional	Fourth	0.965	0.923	0.911	0.958	0.959	0.943	31
Southeast Bank Ltd	Mixed	Second	1	1	1	1	1	1.000	1
Standard Bank Ltd	Mixed	Second	1	0.931	0.941	0.909	0.934	0.943	32
The City Bank Ltd	Mixed	First	0.995	1	0.981	0.934	0.944	0.971	21
Trust Bank Limited	Mixed	Second	1	1	1	1	1	1.000	1
United Commercial Bank Ltd	Conventional	First	0.959	0.949	0.964	1	0.942	0.963	24
Uttara Bank Ltd	Conventional	First	1	0.993	1	1	1	0.999	9
38 PCBs			**0.962**	**0.97**	**0.968**	**0.974**	**0.969**	**0.969**	

Appendix C: Allocative Efficiency of PCBs

Bank	Type	Generation	2013	2014	2015	2016	2017	5Y-Avrg	Rank
Al-Arafah Islami Bank Ltd	Islamic	Second	0.999	0.989	1	0.975	0.979	0.988	8
EXIM Bank Ltd	Islamic	Second	1	1	0.978	0.967	0.919	0.973	11
First Security Islami Bank Ltd	Islamic	Second	0.993	0.988	0.959	0.947	0.974	0.972	12
ICB Islamic Bank Ltd	Islamic	First	0.629	1	1	1	1	0.926	25
Islami Bank Bangladesh Ltd	Islamic	First	1	1	1	1	1	1.000	1
Shahjalal Islami Bank Ltd	Islamic	Third	0.963	0.944	0.966	0.96	0.947	0.956	20
Social Islami Bank Ltd	Islamic	Second	0.945	0.958	0.999	0.979	0.957	0.968	15
Union Bank Ltd	Islamic	Fourth	0.908	0.978	0.989	1	0.981	0.971	13
AB Bank Ltd	Mixed	First	0.97	0.974	1	0.939	0.932	0.963	16
Bangladesh Commerce Bank Ltd	Conventional	Second	0.999	0.962	1	1	1	0.992	6
Bank Asia Ltd	Mixed	Second	0.906	0.882	0.896	0.878	0.829	0.878	35

BRAC Bank Ltd	Conventional	Third	0.95	0.898	0.787	0.751	0.836	0.844	36
Dhaka Bank Ltd	Mixed	Second	0.92	0.934	0.913	0.892	0.876	0.907	32
Dutch-Bangla Bank Ltd	Conventional	Second	0.791	0.877	0.775	0.7	0.628	0.754	38
Eastern Bank Ltd	Conventional	Second	0.898	0.871	0.903	0.891	0.861	0.885	34
IFIC Bank Ltd	Conventional	First	0.939	0.924	0.939	0.926	0.877	0.921	27
Jamuna Bank Ltd	Mixed	Third	0.972	1	0.954	0.956	0.92	0.960	17
Meghna Bank Ltd	Conventional	Fourth	1	1	1	1	0.958	0.992	7
Mercantile Bank Ltd	Conventional	Second	0.942	0.939	0.929	0.964	0.943	0.943	23
Midland Bank Ltd	Conventional	Fourth	0.927	0.993	1	1	1	0.984	10
Modhumoti Bank Ltd	Conventional	Fourth	1	1	1	1	0.996	0.999	4
Mutual Trust Bank Ltd	Conventional	Second	0.923	0.925	0.909	0.92	0.873	0.910	31
National Bank Ltd	Conventional	First	1	1	1	1	1	1.000	1
National Credit & Commerce	Conventional	Second	1	0.967	1	1	0.957	0.985	9
NRB Bank Ltd	Conventional	Fourth	0.951	0.9	0.939	1	0.834	0.925	26
NRB Commercial Bank Ltd	Conventional	Fourth	0.867	0.954	0.942	0.964	0.994	0.944	22
NRB Global Bank Ltd	Conventional	Fourth	1	0.851	0.935	0.968	0.978	0.946	21
One Bank Ltd	Conventional	Second	0.991	0.92	0.966	0.981	0.934	0.958	18
Premier Bank Ltd	Mixed	Second	0.929	0.901	0.876	0.907	0.846	0.892	33
Prime Bank Ltd	Mixed	Second	0.923	1	0.951	0.861	0.829	0.913	30
Pubali Bank Ltd	Mixed	First	0.943	0.958	0.946	0.996	1	0.969	14
South Bangla Agriculture & Commerce	Conventional	Fourth	0.732	0.956	0.957	0.959	0.968	0.914	29
Southeast Bank Ltd	Mixed	Second	0.991	0.937	0.865	1	0.877	0.934	24
Standard Bank Ltd	Mixed	Second	1	0.969	0.952	0.937	0.929	0.957	19
The City Bank Ltd	Mixed	First	0.822	0.814	0.849	0.862	0.856	0.841	37
Trust Bank Limited	Mixed	Second	1	1	1	1	1	1.000	1
United Commercial Bank Ltd	Conventional	First	0.926	0.903	0.9	1	0.859	0.918	28
Uttara Bank Ltd	Conventional	First	1	0.969	1	1	1	0.994	5
38 Banks			**0.938**	**0.948**	**0.947**	**0.949**	**0.925**	**0.941**	

Appendix D: Cost Efficiency of PCBs

Bank	Type	Generation	2013	2014	2015	2016	2017	5Y-Avrg	Rank
Al-Arafah Islami Bank Ltd	Islamic	Second	0.999	0.941	1	0.975	0.915	0.966	11
EXIM Bank Ltd	Islamic	Second	1	1	0.957	0.967	0.918	0.968	9
First Security Islami Bank Ltd	Islamic	Second	0.891	0.926	0.934	0.947	0.974	0.934	15
ICB Islamic Bank Ltd	Islamic	First	0.409	1	1	1	1	0.882	27
Islami Bank Bangladesh Ltd	Islamic	First	1	1	1	1	1	1.000	1
Shahjalal Islami Bank Ltd	Islamic	Third	0.897	0.916	0.928	0.926	0.92	0.917	22
Social Islami Bank Ltd	Islamic	Second	0.868	0.899	0.972	0.979	0.901	0.924	21
Union Bank Ltd	Islamic	Fourth	0.908	0.939	0.956	1	0.931	0.947	13
AB Bank Ltd	Mixed	First	0.97	0.974	1	0.939	0.932	0.963	12
Bangladesh Commerce Bank Ltd	Conventional	Second	0.874	0.957	1	1	1	0.966	10
Bank Asia Ltd	Mixed	Second	0.886	0.877	0.896	0.878	0.829	0.873	29
BRAC Bank Ltd	Conventional	Third	0.894	0.883	0.765	0.72	0.836	0.820	35
Dhaka Bank Ltd	Mixed	Second	0.92	0.844	0.852	0.824	0.794	0.847	33
Dutch-Bangla Bank Ltd	Conventional	Second	0.679	0.765	0.669	0.597	0.538	0.650	38
Eastern Bank Ltd	Conventional	Second	0.874	0.848	0.86	0.845	0.816	0.849	32
IFIC Bank Ltd	Conventional	First	0.918	0.873	0.869	0.854	0.843	0.871	30
Jamuna Bank Ltd	Mixed	Third	0.927	1	0.886	0.895	0.843	0.910	23
Meghna Bank Ltd	Conventional	Fourth	1	1	1	1	0.958	0.992	6
Mercantile Bank Ltd	Conventional	Second	0.913	0.921	0.925	0.964	0.943	0.933	17
Midland Bank Ltd	Conventional	Fourth	0.907	0.993	1	1	1	0.980	7
Modhumoti Bank Ltd	Conventional	Fourth	1	1	1	1	0.99	0.998	4
Mutual Trust Bank Ltd	Conventional	Second	0.814	0.824	0.82	0.831	0.796	0.817	36
National Bank Ltd	Conventional	First	1	1	1	1	1	1.000	1
National Credit & Commerce	Conventional	Second	1	0.967	1	1	0.932	0.980	8
NRB Bank Ltd	Conventional	Fourth	0.951	0.9	0.939	1	0.834	0.925	20
NRB Commercial Bank Ltd	Conventional	Fourth	0.867	0.931	0.907	0.964	0.994	0.933	18
NRB Global Bank Ltd	Conventional	Fourth	1	0.76	0.844	0.902	0.886	0.878	28
One Bank Ltd	Conventional	Second	0.98	0.92	0.917	0.933	0.891	0.928	19
Premier Bank Ltd	Mixed	Second	0.848	0.833	0.805	0.872	0.795	0.831	34
Prime Bank Ltd	Mixed	Second	0.923	1	0.951	0.84	0.812	0.905	24
Pubali Bank Ltd	Mixed	First	0.903	0.917	0.87	0.99	1	0.936	14
South Bangla Agriculture &	Conventional	Fourth	0.706	0.883	0.872	0.918	0.929	0.862	31

Commerce Bank									
Southeast Bank Ltd	Mixed	Second	0.991	0.937	0.865	1	0.877	0.934	16
Standard Bank Ltd	Mixed	Second	1	0.902	0.896	0.852	0.867	0.903	25
The City Bank Ltd	Mixed	First	0.818	0.814	0.832	0.805	0.807	0.815	37
Trust Bank Limited	Mixed	Second	1	1	1	1	1	1.000	1
United Commercial Bank Ltd	Conventional	First	0.889	0.857	0.867	1	0.809	0.884	26
Uttara Bank Ltd	Conventional	First	1	0.962	1	1	1	0.992	5
38 PCBs			0.906	0.92	0.917	0.927	0.898	0.914	

Appendix E: Malmquist Productivity Index of PCBs

Bank	Type	Generation	effch	techch	pech	sech	tfpch
Al-Arafah Islami Bank Ltd	Islamic	Second	0.978	1.025	0.985	0.993	1.003
EXIM Bank Ltd	Islamic	Second	0.989	1.028	1	0.989	1.016
First Security Islami Bank Ltd	Islamic	Second	1.013	1.027	1.024	0.989	1.041
ICB Islamic Bank Ltd	Islamic	First	1.007	1.105	1.116	0.902	1.112
Islami Bank Bangladesh Ltd	Islamic	First	1.003	1.006	1	1.003	1.009
Shahjalal Islami Bank Ltd	Islamic	Third	1.011	1.009	1.011	1	1.02
Social Islami Bank Ltd	Islamic	Second	1.006	1.026	1.008	0.998	1.032
Union Bank Ltd	Islamic	Fourth	0.986	1	0.987	0.999	0.986
AB Bank Ltd	Mixed	First	1	1.06	1	1	1.06
Bangladesh Commerce Bank Ltd	Conventional	Second	1.064	1.011	1.031	1.032	1.076
Bank Asia Ltd	Mixed	Second	1.006	1.014	1.006	1.001	1.02
BRAC Bank Ltd	Conventional	Third	1.02	0.987	1.013	1.007	1.007
Dhaka Bank Ltd	Mixed	Second	0.975	1.026	0.976	1	1.001
Dutch-Bangla Bank Ltd	Conventional	Second	1.027	0.984	0.999	1.028	1.011
Eastern Bank Ltd	Conventional	Second	1.017	1.005	0.993	1.024	1.023
IFIC Bank Ltd	Conventional	First	1.019	1.001	0.995	1.024	1.02
Jamuna Bank Ltd	Mixed	Third	1.036	0.984	0.989	1.048	1.019
Meghna Bank Ltd	Conventional	Fourth	0.985	0.902	1	0.985	0.889
Mercantile Bank Ltd	Conventional	Second	1.017	1.022	1.008	1.01	1.04
Midland Bank Ltd	Conventional	Fourth	1.014	0.916	1.004	1.01	0.928
Modhumoti Bank Ltd	Conventional	Fourth	0.998	0.764	0.999	0.999	0.762
Mutual Trust Bank Ltd	Conventional	Second	1.028	1.002	1.007	1.021	1.031
National Bank Ltd	Conventional	First	1.018	1.009	1	1.018	1.028

National Credit & Commerce Bank Ltd	Conventional	Second	0.993	1.009	0.993	1	1.003
NRB Bank Ltd	Conventional	Fourth	0.992	0.824	1	0.992	0.818
NRB Commercial Bank Ltd	Conventional	Fourth	1.013	0.96	1	1.013	0.972
NRB Global Bank Ltd	Conventional	Fourth	0.975	0.96	0.976	0.999	0.937
One Bank Ltd	Conventional	Second	0.99	1.021	0.991	0.999	1.011
Premier Bank Ltd	Mixed	Second	1.023	1.021	1.004	1.019	1.045
Prime Bank Ltd	Mixed	Second	1.01	0.993	0.995	1.015	1.003
Pubali Bank Ltd	Mixed	First	1.028	0.99	1.011	1.017	1.017
South Bangla Agriculture & Commerce Bank	Conventional	Fourth	1.015	0.955	0.997	1.018	0.969
Southeast Bank Ltd	Mixed	Second	0.998	0.99	1	0.998	0.987
Standard Bank Ltd	Mixed	Second	0.983	1.013	0.983	1	0.995
The City Bank Ltd	Mixed	First	1.015	0.998	0.987	1.029	1.013
Trust Bank Limited	Mixed	Second	1	1.08	1	1	1.08
United Commercial Bank Ltd	Conventional	First	1.006	1.003	0.998	1.008	1.009
Uttara Bank Ltd	Conventional	First	1.083	0.928	1	1.083	1.005
All PCBs (38)			**1.009**	**0.989**	**1.002**	**1.007**	**0.998**

Financial Development and Economic Growth in Bangladesh: Empirical Evidence from ARDLCointegration and Granger Causality Analysis

Kazi Shaibal Siddiqui[1],
Mohammed Abul Kashem[1],
Zahira Hasin[1],
Fardous Mohammed Ziaul Azam[1]

Abstract

The main objective of this study is to examine the empirical cointegration, long and short run dynamics and causal relationships between financial development and economic growth in Bangladesh over the period 1973 to 2015. Employing three different indicators for financial development in the growth form, namely: the ratio of broad money (M2) to GDP, the ratio of total deposit liabilities to GDP, and the ratio of total trade (export plus import) to GDP, the ARDL bounds tests as well as additional cross-checking test convincingly confirmed long run cointegration between economic growth and financial development indicators in Bangladesh. The estimated long run and short run results indicate that, growth in the total trade ratio has insignificant impact on economic growth. However, growth in broad money to GDP ratio and growth in total deposit liabilities to GDP ratio appeared to have time variant impact on economic growth: the former having significant positive impact in the short run but negative in the long run, while the latter has significant negative impact in the short run but positive in the long run on economic growth. On the whole, Granger causality analysis indicated a bidirectional, co-evolutionary process between financial development and economic growth in the context of Bangladesh.

Keywords: Financial Development, Economic Growth, Bounds Testing, ARDL, Co-integration, Error Correction Model, Granger Causality, Bangladesh

JEL Classification: E44, E51, O1, O4, O11, O16, G18, G28

---

[1]The authors are Joint Directors in Forex Reserve & Treasury Management Department, Foreign Exchange Inspection Department, Research Department and Deputy Director in Foreign Exchange Inspection Department of Bangladesh Bank respectively.

The authors are greatly thankful to Dr. Biru Paksha Paul, Chief Economist, Bangladesh Bank, Dr. Md. Habibur Rahman, General Manager, Bangladesh Bank, and Mr. K.M. Jamshed Uz Zaman,Ex-Principal, Bangladesh Bank Training Academy for their very useful comments, suggestions and inspirations. However, the views expressed in this paper are of the authors' own and do not necessarily reflect the views of the Bangladesh Bank.

1.0 Introduction

Since independence in 1971, Bangladesh has gone through waves of policy reforms, resulting in a more liberalized and capitalist outlook. The private sector was made "the engine of growth" and the country entered into a Financial Sector Reform Program (FSRP) from the early 1990s.The major reforms include: Denationalization (and Privatization), Public Finance, Financial Liberalization, Foreign Direct Investment, etc. (Islam, M. F., 1999). The efficacy of these reform programs is better reflected in the economic growth and financial development situation of the country.

There is ample theoretical and empirical evidence of correlation, cointegration and causality between financial development and economic growth. The existence of correlation had been initially articulated by Gurley and Shaw (1955) followed by Goldsmith (1969), McKinnon (1973) and Shaw (1973). In their paper, Gurley and Shaw (1955) gave substantial proof of co-evolution of the real and the financial sectors but without indicating direction of causation. In his cross-country study Goldsmith (1969) also finds evidence of strong correlation between financial development and economic growth. However, most studies advocated for financial liberalization and the results based on single country study of correlation, cointegration and causality between financial development and economic growth are fairly mixed and are dependent mainly on country specific economic fundamentals and data.

In recent times economic growth in Bangladesh has been quite impressive. It is, therefore, inspiring for researchers to identify and assess various contributing factors helping to consolidate and sustain this growth. This study motivated us to mainly focus on the contribution of the financial development towards this achievement.

Against this backdrop, this study makes an effort to investigate the empirical cointegration, long and short run dynamics and causal relationships between financial development and economic growth in Bangladesh. The main objectives of the study are as follows:

1) To find out if Financial Development and Economic Growth in Bangladesh are cointegrated or not;
2) To unfold the long-run and short-run dynamics between Financial Development and Economic Growth in Bangladesh;
3) To assess the form of causal relationship (no direction, unidirectional i.e., whether 'supply-leading' or 'demand-following', or bi-directional, i.e., co-evolutionary) between Financial Development and Economic Growth.

The rest of the research is organized as follows: section 2 gives a brief overview of financial development and economic growth in Bangladesh; Section 3 reviews the literatures; data and methodology are described in section 4; section 5 presents Estimation, Analysis and Findings; and finally, section 6 concludes and provides policy implication of the study.

2.0 Financial Development and Economic Growth in Bangladesh: A Brief Overview

Financial sector development can have many dimensions (Hussein. K., 1999 and Ang & Mckibbin, 2007) and, therefore, it is not possible to incorporate all aspects of financial development in a single variable (Abu-Bader and Abu-Qarn, 2008). As Saci and Holden (2008, p. 1549) also noted: *"In the literature on the interaction between growth and financial development, the problem of measuring financial development is a difficult one"*.

To capture different aspects of the financial system, various indicators have been suggested in the literature. In the absence of any precise definition of "financial development", following the practice of existing literature (King and Levine, 1993a & 1993b; Levine, 1997&1999; and Levine and Zervos, 1998) some indicators of financial development may be used to examine the long and short run dynamics and causal relationships of financial development and economic growth in Bangladesh. Accordingly, three alternative indicators of financial development have been used that are representative of developments in the three key sectors such as Monetary Sector, Banking System and External Sector for Bangladesh economy. These indicators are: 1) ratio of broad money (M2) to GDP, 2) ratio of total deposit liabilities to GDP, and 3) ratio of total trade (export plus import) to GDP.

The first indicator, broad money as a ratio of GDP (M2GDP) is basically the liquid liabilities of the financial system in Bangladesh that includes currency plus demand and interest-bearing liabilities of financial intermediaries. This is the broadest and most common measure of financial development and is considered to be a typical measure of financial "depth". It also indicates the degree of monetization with respect to the real economy.

The second indicator of financial development, following Demetriades and Hussein (1996), Khan et al. (2005), and Boulila and Trabelsi (2002 and 2004) among others, is total deposit (demand plus time) liabilities as a ratio of GDP (denoted by DLGDP) which is a relatively broader measure of financial development aiming to gauge the overall size of the financial intermediary sector. An increase in this ratio can be explained as a development in financial deepening in the economy (Garcia and Liu, 1999; Boulila and Trabelsi, 2004 and Naceur et al., 2007). It also shows the level of liquidity provided to the economy as it includes all the liquid liabilities of the financial system excluding currency in circulation and hence is a key measure of financial depth. Recent studies by King and Levine (1993, a, b), Levine and Zervos (1998), Rousseau and Wachtel (2002) and Chaudhuri and Smiles (2004) used this variable to measure the impact of financial sector on economic growth, and other studies used this variable as a measure of financial deepening.

The Third Indicator, total trade (export plus import) ratio to GDP (denoted by TRGDP) is an indicator of openness and overall development of the external sector of Bangladesh. It is supposed that this variable could also have an impact on economic growth. The omission of this variable could therefore bias the direction of causality between financial

development and economic growth. In view of this, following Jalil.A, and Ma, Y. (2008), Al-Malkawi, et al. (2012), Kiprop, et al. (2015), Sunde, T.(2012) and Nyasha, S., & Odhiambo, N.M. (2015), we employ trade openness as an indicator of financial development. Besides being a measure of financial development and economic growth, this variable can also be considered to contain other information to control for other factors associated with either economic growth or financial development.

Many studies also include capital market data in defining financial development of a country. However, capital market data for Bangladesh is not available for the whole period of 1973-2015; therefore, it is not possible to examine the impact of capital market in financial development of Bangladesh under the current study.

The data as presented in Table 1 below show that the five-year periodic averages of almost all the indicators of financial development used in the study display mostly a steady increasing trend, indicating widening and deepening of the financial system in Bangladesh over time.

Table 1

Trends in the Indicators of Financial Development and Economic Growth in Bangladesh

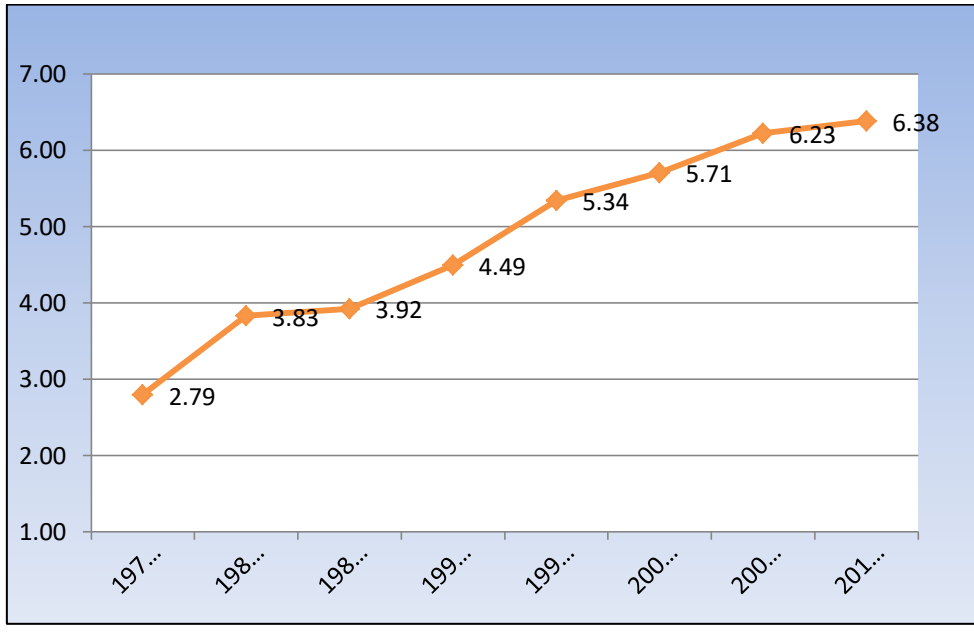
Period	M2GDP	DLGDP	TRGDP	GR_avg*
1976-80	3.11	86.21	152.15	2.79
1981-85	8.02	89.09	120.73	3.83
1986-90	15.63	96.09	81.01	3.92
1991-95	24.05	96.01	83.63	4.49
1996-00	33.73	97.27	96.56	5.34
2001-05	52.71	96.49	84.92	5.71
2006-10	89.86	94.54	89.71	6.23
2011-15	150.68	94.84	78.39	6.38

*Real GDP has been re-calculated for the base year 1995-96

In addition, as can be seen from the Figure1 and Table 1, the five-year periodic averages of the economic growth in Bangladesh also maintained impressive and steady progress, displaying a somewhat similar pattern and moving approximately together with financial development indicators revealing a close association. As seen, Bangladesh Economy grew from an average of 2.79 percent during 1976-80 to about 6.38 percent in 2011-15.

Figure 1

Trends in the Economic Growth in Bangladesh



3.0 Literature Review

The first empirical study to investigate the finance-growth link is Goldsmith's (1969) paper which uses data for 35 countries and finds evidence of a positive correlation between financial development and economic growth and argues that financial development causes economic growth. A very enlightening survey of the literature on finance-growth relationship was provided by Levine (1997) and presented a convincing argument as to how financial development helps reduce market frictions and contributes toward economic growth.

In general, studies that are based on cross-country observations seem to find evidence in favor of the Schumpeterian (1911) view: "*financial development promotes economic growth*" (King and Levine, 1993a and 1993b; Fry, 1978 and 1997; Levine and Zervos, 1998; Levine, 1997 and 1999; and Beck, Levine and Loayza, 2000), since introducing financial development brings about key benefits such as "*reduction in transaction costs, information asymmetries, market frictions and also pools risks*".

Studies based on time series techniques are dominated with the evidence of bi-directional causality (Demetriades and Hussein, 1996; Hansson and Jonung, 1997; Luintel and Khan, 1999; and Shan et al., 2001). On the other hand, studies by Choe and Moosa (1999) on Korean data in the Granger Causality approach and that by Xu (2000) on 41 developing countries in a multivariate VAR model find unidirectional evidence where financial development causes economic growth. On the other hand, some studies such as Al-Malkawi, H. N. et al (2012) on UAE found statistically significant negative relationship and a bi-directional causality between financial development and economic growth.

In the context of Bangladesh economy, financial development and economic growth has continued to be a topic of interest among the researchers, as evident by the growing number of literatures employing different methods and techniques and exploring various aspects of interactions between the two. Rahman, M.H. (2004) investigated the causal relationship between financial development and economic growth in Bangladesh using a Structural Vector Autoregression (SVAR) framework and found that various indicators of financial development and investment had long-run and short run impact on per capita income of Bangladesh. Islam, M.R., Habib, M.W., & Khan, M.H. (2004) also conducted a time series analysis of finance and growth in Bangladesh over the period from 1975 to 2002. Employing a Granger Causality test, their study found causality running from economic growth to financial development in Bangladesh. Kabir, S.H., & Hoque, H.A. A. B. (2007), within the OLS model framework, focused on the impact of financial liberalization upon economic growth of Bangladesh considering three proxies of financial development, such as real interest rate, volume of intermediation, and efficiency of intermediation and observed financial and monetary variables not fully contributing to growth. Uddin, M. G. S., and Chakraborty, L. (2009) employed the co-integration and Granger causality tests to investigate long-run relationship and the direction of causality between financial development, international trade and real income growth in Bangladesh and found no long-run relationship between economic growth and financial development as scaled by money supply and domestic credits. Hye, Q. M. A., & Islam, F. (2013) constructed financial development index (FDI) for Bangladesh using Principal Component Method and used it to explore the existence of a long run relationship between FDI and economic growth employing Autoregressive Distributed Lag (ARDL) approach to cointegration. They found negative impact of real interest rate (RIR) and FDI on economic growth. Bristy, H.J. (2014) used Ordinary Least Squares technique to unfold interaction between financial development and exchange rate volatility in Bangladesh and found exchange rate variability to adversely affect growth due to poorly developed financial market, which discourages innovation and hence in turn lowers the growth.

Shahbaz, M., Rehman, I. U., & Muzaffar, A. T. (2014) revisited the relationship between financial development and economic growth in Bangladesh by incorporating trade openness in production function using quarterly data over the period of 1976-2012. Using combined Bayer-Hanck cointegration in the presence of structural breaks, they showed financial development to facilitate economic growth but capitalization to impede it, while the causality analysis revealed feedback effect between financial development and economic growth. Sikder, M.Z.I., Wadud, M.A., & Hasan, M.A. (2017) employed Johansen's multivariate cointegration to test the long run relationship and vector error correction model to test causality of financial development and economic growth in Bangladesh and India involving time series data of GDP, domestic credit provided by financial sector, domestic credit to private sector, and broad money from 1974 to 2015 and found long term relationship between financial development and economic growth in Bangladesh and India, while at the same time bidirectional causality was confirmed between financial development and economic growth in both the countries. Hossain, A., Biswas, S., Hossain, M.N., & Poddar, A.K. (217) performed Factor Analysis on some selected indicators of Bangladesh financial sector during the period 1988-2013 and then used Granger – Causality test to conclude no financial factor significantly causing economic growth, but rather economic growth causes "depth/stability" factor of financial sector. Kabir, M.N. & Halder, P. (2018) empirically examined the relationship between financial development and economic growth in Bangladesh using time series data over the period of 1977-2016. Applying Johansen Co-integration and Granger-causality test in Vector Error Correction Model (VECM) they found long-run causality from financial development to economic growth.

4.0 Data and Methodology

4.1. Variables and Data

In order to gain valuable insights into the long-run and short-run dynamics as well as the causal relationships between financial development and economic growth in Bangladesh, four variables have been used in the growth form. Using a variable in growth form conveys information regarding the direction of movements of the variable in the current period with respect to the previous period, which can be used to gain valuable intuition regarding future movement of the variable as well. On the other hand, a variable in simple ratio form gives information on the variable for the current period only. Therefore, we can gain more information by using a variable in the growth form rather than using it in simple ratio form.

In this study, we use real GDP growth as proxy for economic development. Remaining

three variables represent financial development indicators in the economy from three sectors: monetary system, banking system, and external economy. The description of all the variables is as follows-

GR: Real GDP Growth
BM: Growth in Broad Money (M2) to GDP Ratio
DL: Growth in Total Deposit Liability to GDP Ratio
TR: Growth in Total Trade (Import plus export) to GDP Ratio

We have used the time series data of Bangladesh economy for the period starting from 1973-74 to 2015-16. The data source is the various issues of the Economic Trends and other publications of Bangladesh Bank, the central bank of Bangladesh. Keeping view with the prime objective of the study, the functional form of the model is as follows:

Economic Growth = f (Financial Development)

The econometric form of the above model is as follows:

$$GR_t = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 BM_t + \boldsymbol{\beta}_2 DL_t + \boldsymbol{\beta}_3 TR_t + \boldsymbol{\varepsilon}_t$$

Where all the variables are same as described above, is the intercept and β_1-β_3 are coefficients of explanatory variables.

4.2 Unit Root Testing

In general, the stationarity issue holds supreme importance in the econometric analysis of times series data, since a stationary series would have time invariant mean and variance. Also, even in the absence of any meaningful relationship among the variables, non-stationary series containing unit root will result in a high co-efficient of determination (R^2), thereby leading to spurious regression (Granger and Newbold, 1974).

Although in ARDL approach of cointegration unit root pre-testing is not essential, the ARDL/Bound Testing methodology of Pesaran and Shin (1999) and Pesaran *et al*. (2001) requires that no variable should be integrated of order 2 or I(2), as such data will invalidate the methodology. It is therefore, justified to test the stationarity of each variable before proceeding to the next level of analysis and inference. The Augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root testing methods will be used for the Unit Roots Testing of the variables under study.

4.3 Cointegration Testing Using ARDL Bounds Testing Approach

The ARDL (Auto Regressive Distributed Lag) bound testing technique developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001) will be employed to investigate the possible existence of cointegration among the variables under study or whether they possess long run equilibrium relationship as well as extracting both the long-run and short-run dynamics.

The ARDL / Bounds Testing methodology of Pesaran and Shin (1999) and Pesaran *et al.* (2001) has a number of advantages over traditional cointegration testing as enumerated below:

- It is very flexible and allows analysis with a mixture of I (0) and I (1) data.
- It involves just a single-equation set-up, making it simple to implement and interpret.
- Unlike the conventional method, different variables can be assigned different lag-lengths in the model.
- It is very much suitable for small samples.
- It provides unbiased estimation of long run relationship and long run parameters (Harris and Sollis, 2005).
- The endogeneity problem is adequately addressed. In this approach Pesaran and Shin (1999) maintain that modeling ARDL with the appropriate number of lags will address autocorrelation and endogeneity problems. According to Jalil *et al.* (2008), endogeneity is less of a problem if the estimated ARDL model is free of autocorrelation.

The basic form of an ARDL regression model used in this study is:

$$GR_t = \beta_0 + \sum_{i=1}^{p} \beta_i GR_{t-i} + \sum_{i=0}^{q_1} \gamma_i BM_{t-i} + \sum_{i=0}^{q_2} \delta_i DL_{t-i} + \sum_{i=0}^{q_3} \sigma_i TR_{t-i} + \varepsilon_t \dots\dots\dots\dots (1)$$

where GR, BM, DL and TR are variables of the study and ε_t is a "well-behaved" random "disturbance" term, i,e., ε_t is serially independent and normally distributed.

For bounds testing of cointegration, the above model is modified in the following manner:

$$\Delta GR_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta GR_{t-i} + \sum_{i=0}^{q_1} \gamma_i \Delta BM_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta DL_{t-i} + \sum_{i=0}^{q_3} \sigma_i \Delta TR_{t-i}$$
$$+\theta_0 GR_{t-1} + \theta_1 BM_{t-1} + \theta_2 DL_{t-1} + \theta_3 TR_{t-1} + \varepsilon_t \dots\dots\dots\dots (2)$$

The model in equation (2) is a particular type of Error Correction Model (ECM), where the coefficients *are not restricted*. Pesaran *et al*. (2001) term it as a "conditional ECM". The appropriate values for the maximum lags, p, q_1, q_2 and q_3 will be determined by using one or more of the "information criteria" - AIC, SC (BIC), HQ, *etc*.
Under the above equation the null and alternative hypotheses are as follows:

H_0 : No cointegration exist

H_1: cointegration exists.

The null hypothesis is tested by conducting F-test for the joint significance of the coefficients of the lagged levels of the variables. Thus

H_0: $\theta_0 = \theta_1 = \theta_2 = \theta_3 = 0$

H_1:$\theta_0 \neq 0, \theta_1 \neq 0, \theta_2 \neq 0, \theta_3 \neq 0$

The distribution of the test statistic is purely non-standard and exact critical values for the F-test are not available for an arbitrary mix of I(0) and I(1) variables. However, Pesaran *et al*. (2001) developed *bounds* on the critical values for the *asymptotic* distribution of the F-statistic. For various situations (*e.g*., different numbers of variables, (k + 1)), they supply lower and upper bounds on the critical values. However, since the study is based on a relatively smaller sample size, we shall also compare the computed F-test value with the bounds critical value tables provided by Narayan (2005) as these are more suitable for small samples.

In each case, the lower bound is based on the assumption that all of the variables are I (0), and the upper bound is based on the assumption that all of the variables are I (1). If the computed F-statistic falls below the lower bound, the variables are I(0), so no cointegration is possible, by definition. If the F-statistic exceeds the upper bound, we conclude that we have cointegration. Finally, if the F-statistic falls between the bounds, the test is in conclusive & we will have to resort to other techniques of cointegration.

Following Giles, D. (2013), it is also necessary to conduct, as a cross-check, a "Bounds t-test" as stated below:

$$H_0 : \theta_0 = 0, \text{ against } H_1 : \theta_0 < 0.$$

The decision rule for this test is as follows:

If the t-statistic for GR_{t-1} in equation (2) is greater than the "I (1) bound" tabulated by Pesaran *et al.* (2001; pp.303-304), this would support the conclusion that there is a long-run relationship between the variables. If the t-statistic is less than the "I (0) bound", we would conclude that the data are all stationary.

Short run parameters are estimated using the regular error correction mechanism (ECM) as depicted is equation (3) below:

$$\Delta GR_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta GR_{t-i} + \sum_{i=0}^{q_1} \gamma_i \Delta BM_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta DL_{t-i} + \sum_{i=0}^{q_3} \sigma_i \Delta TR_{t-i} + \alpha ECT_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots (3)$$

The error correction model results indicate the speed of adjustment back to long run equilibria after a short run shock. The ECM integrates the short-run coefficient with the long-run coefficient without losing long-run information. Under ECM technique, the long run causality is depicted by the negative and significant value of the error correction term (ECT) coefficient α and the short run causality is shown by the significant value of other regressor variables.

4.4 Diagnostic Tests of the Model

One of the most important and crucial assumptions in the ARDL / Bounds Testing methodology of Pesaran *et al.* (2001) is that the errors of equation (2) must be serially independent and normally distributed. Therefore, both 'Q-Statistics' and 'Breusch-Godfrey Serial Correlation LM test' will be used for testing Serial Independence and 'Jarque-Bera' test will be used for testing Normality of the errors of the model. The heteroskedasticity will also be checked using 'Breusch-Pagan-Godfrey' test.

4.5 Stability Test of the Model

It is indispensable to ensure the 'dynamic stability' of any model having autoregressive structure. The stability of the model will be checked by using Recursive CUSUM and CUSUM of squares (Brown, Durbin, and Evans, 1975) estimates. These tests are also suggested by Pesaran and Pesaran (1997) for measuring the parameter stability.

4.6 Granger Causality Test

According to Granger (1969), measuring the *correlation* between variables is not enough

to construct a complete understanding about the relationship between two or more time series. This is because some correlations may be spurious and not useful, as there might be a hint of existence of a third variable that cannot be accounted for. This is the core idea of performing the causality test.

Following Toda-Yamamoto (1995) procedure[2], the Granger Causality among the variables under an augmented Vector Autoregression (VAR) framework will be estimated.

5.0 Estimation, Analysis and Findings

The 'Unit Root Testing' of the variables, appropriate maximum lag lengths selection of the model &the ARDL model estimation, and Granger Causality along with all the diagnostics and stability testing of the model were done using E-Views 9.0 software**.** E-Views version 9.0 contains a full-functioning ARDL estimation option, together with bounds testing and an analysis of the long-run relationship between the variables being modeled.

5.1 Unit Root Testing

The Augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root testing results are displayed in the following table:

Table 2

Results of Unit Root Test

	ADF	KPSS
	H_0: Variable has a unit root	H_0: Variable is Stationary
Variables	LEVEL	LEVEL

[2]For a detailed discussion with example of the procedure, see Dave Giles (2011)

	Intercept	Intercept &Trend	Intercept	Intercept &Trend
1) GR	-1.310367 (0.6130)	-1.384674 (0.8469)	0.324469***	0.162549***
2)BM	-3.141236** (0.0314)	-4.085544** (0.0135)	0.179352***	0.090343***
3) DL	-2.032696 (0.2722)	-3.021826 (0.1392)	0.405472***	0.100826***
4) TR	-7.688773*** (0.0000)	-8.780198*** (0.0000)	0.314753***	0.063853***
	First Difference		First Difference	
1) GR	-7.053234*** (0.0000)	-7.014645*** (0.0000)	0.321514***	0.152813***
2)BM	-6.320431*** (0.0000)	-6.427239*** (0.0000)	0.50000***	0.407467
3) DL	-6.628534*** (0.0000)	-6.635181*** (0.0000)	0.208840***	0.174610***
4) TR	-12.04880*** (0.0000)	-11.90453*** (0.0000)	0.217293***	0.099827***

(*,**and***denote statistical significance at the10%, 5%and 1% levels respectively; p-values in the parentheses (.))

It can be inferred from the above estimates that under KPSS test all variables are stationary at levels and hence of order *I (0)*. However, under ADF test, GR and DL are non-stationary at levels but attain stationarity after first differences and therefore, are of order *I (1)*, while other variables are stationary at the levels. Therefore, the true order of integration of the variables GR and DL are inconclusive. This mix and uncertain order of integration of the variables justifies using the ARDL approach of cointegration. However, as required by the ARDL bound testing technique developed by Pesaran and Shin (1999) procedure[3], and Pesaran *et al.* (2001), the results of the ADF and KPSS unit root testing confirm that no variable is I(2).

5.2 ARDL model estimation

The 'Akaike Information Criterion (AIC)' has been used to determine the optimum lag length of the model. The selected model is ARDL (2, 4, 4, 0). Therefore, the optimum lag lengths of the variables GR, BM, DL and TR are: p=2,q_1=4, q_2=4, and q_3=0 respectively. The trend variable has been used to cover for a variable which is not directly observable

[3]For a detailed discussion with example of the procedure, see Dave Giles (2011)

but impacts the dependent variable, and is highly correlated with time. This also ensured stability of the model.

5.3 Diagnostic Tests of the Model

As far as the diagnostic checks are concerned, this model is good fit and it passes all the diagnostic tests. The R-squared is 0.874092 (Adj-R^2:0.800645), implying that almost 87.5 percent variations in the dependent variable are explained by the model and the rest by the error term. The DW statistics is 2.012823, which confirms that the model is not spurious. Moreover, the computed F-statistic (11.90106) clearly rejects the null hypothesis that the regressors have zero coefficients (p-Value: 0.00). As illustrated in the table below, the model passes the test regarding serial correlation (Q-Statistics and Breusch-Godfrey Serial Correlation LM tests), Normality (Jarque-Bera test) and Heteroscedasticity ('Breusch-Pagan-Godfrey' test).

Table 3

Model Diagnostic Tests Results

Test	χ^2	Probability
Breusch-Godfrey Serial Correlation LM test	0.026341	0.9869
Breusch-Pagan-Godfrey Heteroskedasticity test	10.32160	0.7383
Jarque-Bera test	3.321773	0.189971

The Q-Statistics (E-Views output) in Figure 2 below also shows that all the spikes are within range in both the cases, therefore, re-affirming that the errors of the model is serially independent.

Figure 2

Q-Statistics result from E-Views 9.0

Date: 08/22/16 Time: 21:00
Sample: 1973 2015
Included observations: 39
Q-statistic probabilities adjusted for 2 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.015	-0.015	0.0092	0.924
		2	0.001	0.000	0.0092	0.995
		3	-0.058	-0.058	0.1569	0.984
		4	-0.244	-0.246	2.8685	0.580
		5	-0.027	-0.041	2.9040	0.715
		6	-0.131	-0.146	3.7294	0.713
		7	0.146	0.115	4.7908	0.685
		8	-0.161	-0.245	6.1196	0.634
		9	-0.170	-0.236	7.6663	0.568
		10	0.155	0.087	8.9905	0.533
		11	0.014	0.048	9.0023	0.622
		12	0.091	-0.048	9.4945	0.660
		13	0.091	0.019	10.009	0.693
		14	-0.023	-0.048	10.042	0.759
		15	-0.089	-0.065	10.573	0.782
		16	-0.174	-0.135	12.689	0.695

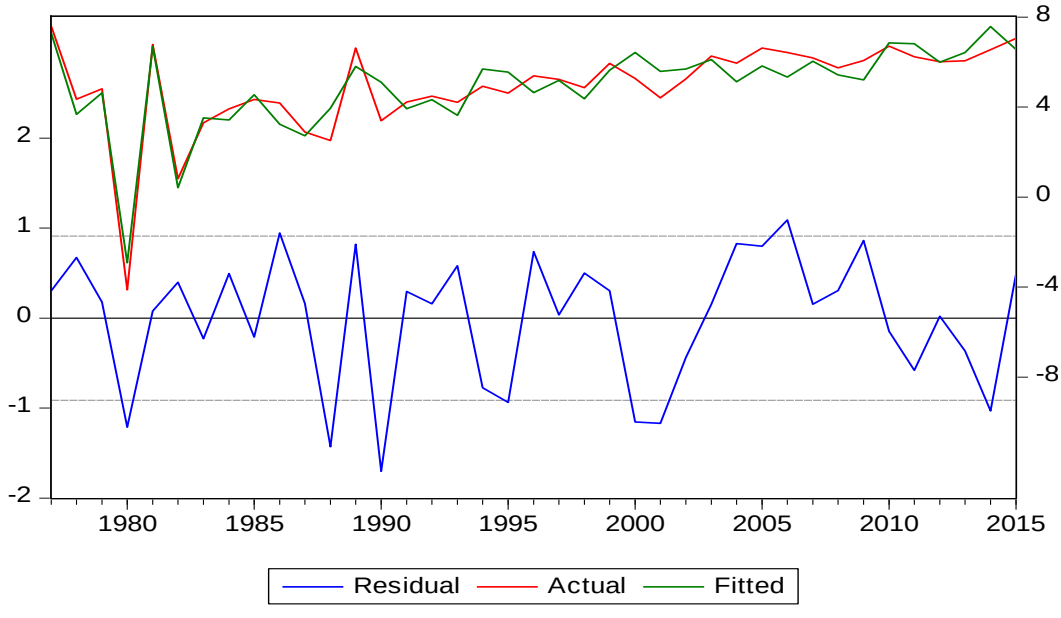
*Probabilities may not be valid for this equation specification.

5.4 Fit of the Model

The Actual/Fitted/Residual plot of the unrestricted ECM of our model shows that the fit of model is good enough in terms of explaining the level of GR variable (Figure 3).

Figure3

Actual/Fitted/Residual plot (E-Views 9.0 output)



5.5 ARDL Bounds Test

Since the model passed all the diagnostics tests, we now move to the next level of analysis, i.e., bounds test for cointegration. The associated F-test obtained is as follows:

Table 4

Result of ARDL Bounds Testing

Variables	F-Statistics	Result
F(GR/BM DL TR)	14.13421***	Cointegration

(***significant at 1% significance level**)**

For k=3 (number of independent variables) the relevant critical values with unrestricted intercept and linear trend from table CI(v) on p.301 of *Pesaran et al. (2001)*, and for k=3, n≈40 the table for case (v) on p.1990 of *Narayan (2005)* is given below:

Table 5

Bounds Testing Critical Values from Pesaran and Narayan

	Pesaran	Narayan

Critical Values	Lower Bound I(0)	Upper Bound I(1)	Lower Bound I(0)	Upper Bound I(1)
1%	5.17	6.36	6.238	7.740
5%	4.01	5.07	4.510	5.643
10%	3.47	4.45	3.760	4.795

As the value of the computed F-statistic exceeds the upper bound even at the 1% significance level in both the Pesaran and Narayan relevant table of critical values, we can conclude that *there is evidence of a long-run relationship between the time-series of our model* (at this level of significance or greater).

Cross Checking for cointegration:
In addition, the t-statistic on GR_{t-1} is -7.232627. When we look at Table CII (v) on p.304 of Pesaran *et al*. (2001), we find that the I(0) and I(1) bounds for the t-statistic at the 1%, 5%, and 10% significance levels are [-3.96,-4.73], [-3.41,-4.16], and [-3.13,-3.84] respectively. As seen, even at the 1% significance level, the computed t-statistic on GR_{t-1} far exceeds the corresponding value for I(1), thus reinforcing our conclusion that there is a long-run relationship among the variables.

5.6 Long Run and Short Run Relationships

5.6.1 Long Run Dynamics

The long run equilibrium relationship among the variables estimated using the ARDL approach is given in the table below:

Table 6

Estimated Long Run Coefficients using ARDL Approach

Variables	Coefficient	t-Statistic	Probability
BM	-55.034010**	-2.361624	0.0267
DL	51.296553**	2.376805	0.0258
TR	1.397866	0.776925	0.4448
C	4.752900***	4.261138	0.0003
@TREND	0.177124***	7.104501	0.0000

(*,**and***denote statistical significance at the 1%, 5%and 10% levels respectively)

The above result shows that the coefficients are significant for the variables BM (Growth of M2 to GDP ratio) and DL (Growth of Total Deposit Liability to GDP ratio) but insignificant for TR (Growth of Total Trade to GDP ratio). This indicates that money supply growth has negative and total deposit liability growth has positive impact on the

Economic growth in the long run which is confirmed by the sign and statistical significance of their coefficients as shown in the Table6 above. It is also confirmed that the long run impact of total trade growth or openness is insignificant.

Although the long-run money supply growth coefficient for Bangladesh has negative sign, it is not unique to this study alone. Several other studies have shown evidence of negative association between the two (see also De Gregorio and Guidotti, 1995; Adu *et al*., 2013; Nyasha, S. and Odhiambo, N.M., 2015; Al-Malkawi, H.N. *et al*., 2012).

5.6.2 Short Run Dynamics

The following OLS equation is tested for the short run causality in ARDL (2,4,4,0) framework:

Table 7

Estimates from the Error Correction Mechanism

Variables	Coefficient	t-Statistic	Probability
D(GR(-1))	0.001729	0.011699	0.9908
D(BM)	-0.041612	-0.004707	0.9963
D(BM(-1))	13.582783	1.475214	0.1532
D(BM(-2))	17.206355***	2.882940	0.0082
D(BM(-3))	22.063707***	3.332042	0.0028
D(DL)	2.459368	0.248021	0.8062
D(DL(-1))	-2.152558	-0.223838	0.8248
D(DL(-2))	-23.005596***	-3.570047	0.0015
D(DL(-3))	-12.415554*	-1.839914	0.0782
D(TR)	1.343499	0.742753	0.4648
D(@TREND())	0.170235***	5.394584	0.0000
CointEq(-1)	-0.961107***	-4.4882	0.0002

(*,**and***denote statistical significance at the 10%, 5% and 1% levels respectively)

The results corresponding to equation (3) are shown by the Table 7 above. We conclude that short-run dynamics is in conjunction with the long-run relationships as shown by the value and sign of lagged error correction term (ECT) coefficient α [CointEq(-1)]. As required, ECT has a negative sign and it is very significant even at 1% level. This represents that there exists long term relationship between the dependent variable and the regressors. In addition, the value of ECT coefficient is-0.961107, which signifies strong and a faster speed of adjustment to equilibrium. Thus nearly 96% of the disequilibrium converges back to the long-term equilibrium within one period (one year).

From the same table it is seen that as in the long run, TR (Total Trade Growth) does not have any impact on economic growth in the short run also, which is confirmed by its statistically insignificant coefficient. However, BM (Growth in Money Supply) has mostly positive and significant impact on economic growth in the short run which is confirmed by the sign and statistical significance of the coefficients of its second and third lagged values in the first differences. This is in contrast with its long run impact which is negative (Table 6). The variable DL (Total Deposit Liability growth) has a significant but mostly negative impact on economic Growth in the short run. This is confirmed by the sign and statistical significance of the coefficients of its second and third lagged values in the first differences. Like BM, the result is also in contrast to its long run impact which is positive (Table 6).

Therefore, we may conclude that the overall impact of both BM and DL on GR is time variant, i.e., having opposite short run and long run impact on economic growth. In addition, we may conclude from the foregoing argument that monetary and bank-based financial development, rather than openness propel the real sector in Bangladesh.

5.7 Stability of the Model

To ensure the robustness of our results we employ structural stability tests on the parameters of the long-run results based on the cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals of squares (CUSUMSQ) tests as suggested by Pesaran and Pesaran (1997). A graphical representation of CUSUM and CUSUMSQ statistics are provided in Figure 4 and Figure 5 below. If the plots of the CUSUM and CUSUMSQ remain within the 5 per cent critical bound, it would signify the parameter constancy and the model stability. Both the plots indicate that none of the straight lines (drawn at the 5 percent level) are crossed by CUSUM and CUSUMSQ. i.e., the plots of both the CUSUM and CUSUMSQ are within the boundaries (shown by the dotted red lines) and therefore these statistics confirm the model stability and that there is no systematic change identified in the coefficients at 5% significance level over the study period.

Figure4

Plot of CUSUM Tests

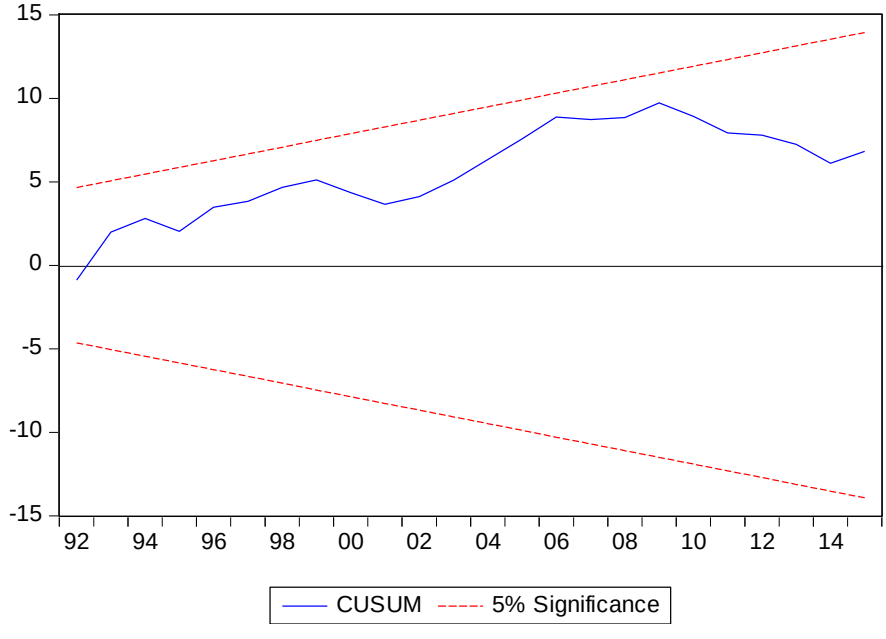
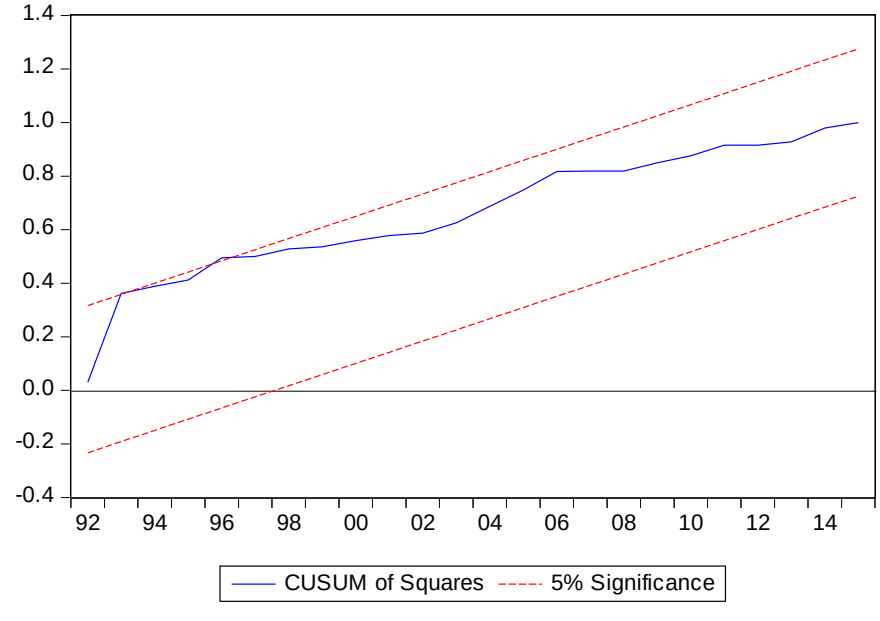


Figure 5

Plot of CUSUM of Squares Tests



5.8 Granger Causality Test

Following Patrick (1966) who postulated the existence of a feedback/interaction relationship between economic growth and financial development, most literature focus on two main diverging theoretical paradigms: the "supply leading hypothesis" and the "demand following hypothesis". While the 'supply-leading' hypothesis posits a unidirectional causation that runs from 'financial deepening to economic growth', the 'demand-following' hypothesis posits an opposite direction of causality, a unidirectional causation from 'economic growth to financial development' (Balago, G.S., 2014).

Some other researchers, however, observe a complex link between financial development and economic growth in the form of both way causality and are in favor of the view of a joint evolution of the real and financial sectors during the growth process (Gurley and Shaw, 1955; Greenwood and Jovanovic, 1990; Galetovic, 1996; Greenwood and Smith, 1997; and Bencivenga and Smith, 1998).

After examining the long run relationship between the variables, we use the Granger causality test to determine the causality between the variables. As we found cointegration among the variables, we may expect uni or bidirectional causality among the series. We examine the causal relationships between financial development and economic growth in Bangladesh within an augmented VAR framework following Toda-Yamamoto (1995) procedure. The Table 8 and the arrow diagram for causal channels in Figure 6 below show the short run granger causality among the variables.

As seen, in the context of Bangladesh, Financial Development Indicators such as broad money growth and total deposit liability growth has short-run bidirectional causality with

Table 8

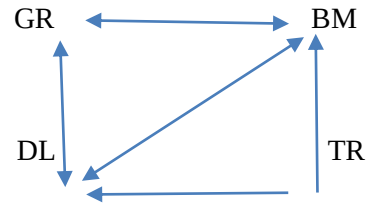
Granger Causality/Block Exogeneity Wald Tests

	Dependent Variable				Direction ofCausality
	GR	**BM**	**DL**	**TR**	
GR	- - -	8.116316**	13.31659***	1.502639	GR→BM; GR→DL
BM	10.12209**	- - -	11.23983**	1.276714	BM→GR; BM→DL
DL	7.749200*	17.05351***	- - -	2.452185	DL→GR; DL→BM
TR	4.220478	10.31926**	11.32280**	- - -	TR→BM; TR→DL

(*,**and***denote statistical significance at the10%, 5% and 1% levels respectively)

Figure 6

Causal Channels



economic growth (GR & BM and GR & DL), but total trade growth (TR) as a financial development indicator does not have any direct causal link with economic growth. In addition, among the financial development indicators, BM and DL has bidirectional causality between them, while TR granger causes both BM and TR, but not the other way around.

However, although TR does not have any direct causal link with GR, since TR causes BM and DL while both BM and DL have bidirectional causality with GR, we may infer that TR indirectly causes GR, or in other words, TR causes GR through the channels of BM and DL.

Therefore, in the context of Bangladesh, except for total trade growth (TR) which may cause GR indirectly through the channels of BM and DL thus showing a very weak evidence of the 'supply-leading' hypothesis, we do not find any strong and conclusive evidence for either 'supply-leading' or 'demand-following' hypothesis. Rather, on the whole, there is evidence of strong both way or bi-directional causality between financial development and economic growth in Bangladesh which favors the view of a joint evolution of the real and financial sectors during the growth process as stated above (Demetriades and Hussein, 1996; Hansson and Jonung, 1997; Luintel and Khan, 1999; and Shan et al., 2001, Al-Malkawi, H. N. et al., 2012)

In this sense, we may conclude that there exists a co-evolutionary process between financial development and economic growth in Bangladesh, i.e., the evolution of financial development and economic development are jointly determined.

6.0 Conclusion and Policy Implications

This paper has examined the empirical cointegration, long and short run dynamics and causal relationships between financial development and economic growth for the case of Bangladesh over the period 1973 to 2015. Accordingly, we applied the ARDL/Bounds

Testing methodology developed by Pesaran and Shin (1999) and Pesaran *et al*. (2001) to investigate cointegaration, Unrestricted Error Correction Model (UECM) of Pesaran and Shin (1999) and Pesaran *et al*. (2001) for long and short run dynamics and the Toda-Yamamoto Procedure of Granger Causality in a VAR framework.

The analysis was performed employing three different indicators for financial development in the growth form, namely: the ratio of broad money (M2) to GDP, the ratio of total deposit liabilities to GDP, and the ratio of total trade (export plus import) to GDP. The ARDL bounds tests as well as additional cross-checking confirmed long run cointegration between economic growth and financial development indicators in Bangladesh. The coefficient of the error correction term is statistically significant at 1% levels of significance and has the expected negative sign with a value of (-0.961107), which signifies a very strong and faster speed of adjustment to equilibrium. Thus nearly 96% of the disequilibrium converges back to the long term equilibrium within one period (one year). The estimated model passed all the diagnostics tests and was also found to be stable.

The estimated long run and short run results indicate that, growth in the total trade ratio (TR) has insignificant impact, both in the short and long-run, on economic growth (GR). However, except for TR, the other two financial development indicators, growth in broad money to GDP ratio (BM) and growth in total deposit liabilities to GDP ratio (DL) appeared to have time variant impact on economic growth: BM mostly appear to have significant positive impact in the short run but negative impact in the long run, while DL showed mostly significant negative impact in the short run but positive impact in the long run on economic growth. This result implies that it is the monetary and bank-based indicators, rather than openness are better financial development indicators for economic growth in Bangladesh.

The results of the short run granger causality analysis indicate existence of mostly bi-directional causality channels between financial development and economic growth: GR & BM, GR & DL, except TR which has no direct causal link with economic growth in the short run. Among the financial indicators, BM and DL also show bi-direction causality between themselves while unidirectional causality exists between TR & BM and TR & DL. In this situation, because TR causes both BM and DL which have bidirectional causal links with GR, we may conclude that TR causes GR indirectly

through the BM and DL channels. On the whole, we found a co-evolutionary process between financial development and economic growth in Bangladesh, i.e., the evolution of financial development and economic development are jointly determined in the context of Bangladesh.

As the foregoing arguments imply, Bangladesh should continue with its efforts for economy wide reform and liberalization programs. The results of the study imply that financial and banking sector development should get proper attention to continue its long run positive impact on economic growth because, a well-functioning financial system help mustering savings and promote investment and thus contribute toward greater economic growth. The long run negative impact of broad money growth on economic development also posits a caution regarding careful and proper planning and implementation of the monetary policy in Bangladesh and to find an optimum level of money supply in the economy. This study also suggests improvements in the external sector and openness of the economy because of its perceived influence on economic growth through the monetary and banking sector channels.

References:

Abu-Bader, S., & Abu-Qarn, A. S. (2008). Financial Development and Economic Growth: the Egyptian Experience. *Journal of Policy Modeling, 30*(5), 887–898.

Adu, G., Marbuah, G. & Mensah, J.T. (2013).Financial development and economic growthin Ghana: Does the measure of financial development matter? *Review of Development Finance.* 3, 192-203.

Al-Malkawi, H. N., Marashdeh, H.A., & Abdullah, N. (2012).Financial Development and Economic Growth in the UAE: Empirical Assessment Using ARDL Approach to Co integration. *International Journal of Economics and Finance,* 4(5).

Ang, J. B., & McKibbin, W. J. (2007). Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia. *Journal of Development Economics, 84*(1), 215–233.

Balago, G.S. (2014).Financial Sector Development and Economic Growth in Nigeria: An Empirical Investigation.*International Journal of Finance and Accounting*, 3(4), 253-265.

Bencivenga, V. R., & Smith, B. D. (1998). Economic Development and Financial Depth in a Model with Costly Financial Intermediation.*Research in Economics*, 52, 363-386.

Bencivenga, V. R., & Smith, B. D. (1991). Financial Intermediation and Endogenous Growth.*The Review of Economic Studies*, 58(2),195-209.

Beck, T., Levine, R. &Loayza, N. (2000). Finance and the sources of economic growth. *Journal of Financial Economics*, 58, 261-300.

Beck, T., Levine, R. & Loayza, N. (1991). Financial Intermediation and Endogenous Growth. *The Review of Economic Studies,* 58(2), 195-209.

Boulila, G., & Trabelsi, M. (2002). Financial Development and Long-Run Growth: Granger Causality in a Bivariate VAR Structure. Evidence from Tunisia: 1962–1997.*FSEGT Working Paper*.

Boulila, G., & Trabelsi, M. (2004). The Causality Issue in the Finance and Growth Nexus: Empirical Evidence from Middle East and North African Countries. *Mimeo Central Bank of Lesotho, Quarterly Review, 23*(3).

Bristy, H.J. (2014). Impact of Financial Development on Exchange Rate Volatility and Long-Run Growth Relationship of Bangladesh. *International Journal of Economics and Financial Issues*, 4(2), 258-263.

Brown, R.L., Durbin, J. &Evans, J.M. (1975).Techniques for Testing the Constancy ofRegression Relationships over Time.*Journal of the Royal Statistical Society*, Series B, 35, 149-192.

Chaudhuri, K., & Smiles, S. (2004). Stock Market and Aggregate Economic Activity: Evidence from Australia.*Applied Financial Economics*, 14, 121–129.

Choe, C. & Moosa, I. A.(1999). Financial System and Economic Growth: The KoreanExperience. *World Development*, 27(6), 1069-1082.

De Gregorio, J. & Guidotti, P.E. (1995). Financial Development and Economic Growth.*World Development*, 23(3), 433-448.

Demetriades, P. O. & Hussein, K. A. (1996). Does Financial Development Cause Economic Growth? Time-Series Evidence from 16 Countries. *Journal of Development Economics*, 51, 387-411.

Dickey, D. A. & Fuller, W. A. (1981).Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49(4), 1057-1072.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring.*The Review of Economic Studies*, 51(3), 393-414.

Islam, M.R., Habib, M.W., & Khan, M.H. (2004). A Time Series Analysis of Finance and Growth in Bangladesh. The Bangladesh Development Studies, Bangladesh Institute of Development Studies (BIDS), 30(1/2), 111-128.

Fry, M. J. (1997). In Favor of Financial Liberalization. The Economic Journal, 107(442), 754-770.

Fry, M. J. (1978). Money and Capital or Financial Deepening in Economic Development?.Journal of Money, Credit and Banking, 10(4), 464-475.

Galetovic, A. (1996). Specialization, intermediation and growth. Journal of Monetary Economics, 38, 549-559.

Garcia, V. F., & Liu, L. (1999). Macroeconomic Determinants of Stock Market Development.Journal of Applied Economics, 2(1), 29–59.

Giles,D. (2011). Testing for Granger Causality.http://davegiles.blogspot.com/2011/04/testing-for-granger-causality.html

Giles, D.(2013). ARDL Models - Part II - Bounds Tests. http://davegiles.blogspot.ca/2013/06/ardl-models-part-ii-bounds-tests.html

Goldsmith, R. W. (1969). Financial Structure and Development. Yale University Press, *New Haven.*

Granger, C.W.J. (1969). Investigating causal relations by econometric models: cross spectral methods.*Econometrica*, 37(3), 424-438.

Granger, C.W.J. & Newbold, P. (1974). Spurious Regression in Econometrics. *Journal of Econometrics*, 2,111-120.

Greenwood, J. & Jovanovic, B. (1990). Financial Development, Growth and the Distribution of Income.*Journal of Political Economy*, 98(5), 1076-1107.

Greenwood, J. & Smith, B. D. (1997). Financial markets in development and the development of financial markets.*Journal of Economic Dynamic and Control,* 21, 145-181.

Gurley, J. G. & Shaw, E. S. (1955). Financial Aspects of Economic Development. *TheAmerican Economic Review*, 45(4), 515-538.

Harris, R., & Sollis, R. (2005). *Applied Time Series Modelling and Forecasting.* Chichester: John Willey & Sons, 2003, reprinted 2005.

Hansson, P. & Jonung, L. (1997). Finance and economic growth: the case of Sweden 1834-1991.*Research in Economics*, 51, 275-301.

Hossain, A., Biswas, S., Hossain, M.N., & Poddar, A.K. (217). Financial Sector Development and Economic Growth in Bangladesh: A Factor Analysis Based Causality Approach. *International Journal of Economics and Finance*, 9(8).

Hussein, K. (1999). *Finance and Growth in Egypt. Paper prepared for the Workshop on Financial Development* Organized by EPIC and ECES. Cairo, Egypt.

Hye, Q. M. A. & Islam, F. (2013). Does Financial Development Hamper Economic Growth: Empirical Evidence From Bangladesh. *Journal of Business Economics and Management*, 14(3), 558–582.

Islam, M. F. (1999). The Emergence of Market-Oriented Reforms in Bangladesh: A Critical Appraisal. *Journal of Bangladesh Studies*,1.

Jalil, A. & Ma, Y. (2008). Financial Development and Economic Growth: Time Series Evidence from Pakistan and China. *Journal of Economic Cooperation,* 29(2), 29-68.

Kabir, M.N. & Halder, P. (2018). Financial Sector Development and Economic Growth: Empirical Evidence from Bangladesh. *Asian Economic and Financial Review,* 8(6), 799-814.

Kabir, S.H., & Hoque, H.A. A. B. (2007). Financial Liberalization, Financial Development and Economic Growth: Evidence From Bangladesh. *Centre for Socio-economic Dynamics and Cooperation of the University of Berga*, 31 (4), 431-448.

Khan, M. A., Abdul, Q. & Sheikh, S. A. (2005). Financial Development and Economic Growth: The Case of Pakistan. *The Pakistan Development Review, 44*(4 Part II), 819–837.

King, R.G.& Levine, R. (1993). Finance and Growth: Schumpeter Might be Right. *Quarterly Journal of Economics*, 108(3), 717-737.

King, R.G. & Levine, R. (1993). Finance, Entrepreneurship and Growth: Theory and Evidence.*Journal of Monetary Economics*, 32, 513-542.

Kwiatkowski, D., Phillips,P.,Schmidt, P.,& Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*, 54, 159-178.

Kiprop, M.J., Kalio, A., Kibet, L.,& Kiprop, S. (2015). Effect of Financial Development on Economic Growth in Kenya: Evidence from Time Series Analysis. *European Journal of Business and Social Sciences,* 3(11), 62 – 78.

Kyophilavong, P., Uddin, G.S., & Shahbaz, M. (2014). The Nexus between Financial Development and Economic Growth in Laos. https://mpra.ub.uni-muenchen.de/57308/1/ MPRA_paper_57308.pdf

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, 35(2), 688-726.

Levine, R. (1999). Law, Finance and Economic Growth. *Journal of Financial Intermediation*, 8, 8-35.

Levine, R., Loayza, N., & Beck,T. (2000). Financial Intermediation and Growth: Causality and Causes.*Journal of Monetary Economics*, 46, 31-77.

Levine, R.,&Zervos, S. (1998). Stock Markets, Banks and Economic Growth. *American Economic Review*, 88(3), 537-559.

Luintel, K. B.,&Khan, M. (1999). A quantitative reassessment of the finance-growth nexus: evidence from a multivariate VAR. *Journal of Development Economics*, 60, 381-405.

McKinnon, R. I. (1973). *Money and Capital in Economic Development*. The Brookings Institution, Washington, D.C.

Narayan, P. K. (2005). The Saving and Investment Nexus for China: Evidence fromCointegration Tests. *Applied Economics*, 37(17), 1979-1990.

Naceur, S., Ghazouuani, S., & Omaran, M. (2007). The Determinants of Stock Market Development in the Middle-Eastern and North African region. *Managerial Finance, 33*(7), 477–489.

Nyasha, S., & Odhiambo, N.M. (2015). Financial Systems and Economic Growth: Empirical Evidence from Australia. *UNISA Economic Research Working Paper Series*, Working Paper 05/2015

Patrick, H. (1966). Financial Development and Economic Growth in Underdeveloped Countries. *Economic Development and Cultural Change*, 174-189.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium* (Chapter 11 in S. Strom (ed.)). Cambridge University Press, Cambridge.

Pesaran, M. H., Shin, Y., & Smith, R. J.(2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289–326.

Pesaran, M. H., & Smith, R. P. (1998). Structural analysis of cointegrating VARs. *Journal of Economic Surveys*, 12, 471-505.

Rahman, M.H. (2004).Financial Development-Economic Growth Nexus: A Case Study of Bangladesh. *Bangladesh Development Studies*, *Bangladesh Institute of Development Studies (BIDS*), 30(3-4), 113-128.

Rousseau, P. L., & Wachtel, P. (2002). Inflation thresholds and the finance-growth nexus. *Journal of International Money and Finance*, 21, 777-793.

Saci, K., & Holden, K. (2008). Evidence on Growth and Financial Development using Principal Components. *Applied Financial Economics*, 18, 1549–1560.

Schumpeter, J.A. (1911). The Theory of Economic Development, An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. *Cambridge MA, Harvard University Press*Stern, 1989.

Shahbaz, M. Rehman, I. U. and Muzaffar, A. T. (2014). Re-visiting Financial Development and Economic Growth Nexus: The Role of Capitalization in Bangladesh. *Online at MPRA Paper No. 57500*.

Shan, J. Z., Morris, A. G., & Sun, F. (2001). Financial Development and Economic Growth: An Egg-Chicken Problem.443-454.

Shaw, E.S. (1973). Financial Deepening in Economic Development. *Oxford University Press, London*.

Sikder, M.Z.I., Wadud, M.A., & Hasan, M.A. (2017). Financial Development and Economic Growth in Bangladesh and India: Evidence from Cointegration and Causality Tests. *ResearchGate, https://www.researchgate.net/publication/324679125.*

Sunde, T. (2012). Financial sector development and economic growth nexus in South Africa. *Int. J. Monetary Economics and Finance*.

Toda, H. Y., & Yamamoto, T. (1995). Statistical inferences in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, 66, 225-250.

Uddin, M. G. S., & Chakraborty, L. (2009). International Trade, Financial Development and Economic Growth Nexus in Bangladesh: Empirical Evidence From Time Series Approach. *Conference: 2009 International Finance Conference, IIM, Joka, Calcutta,*

Wang, C., & Williamson, S. D. (1998). Debt Contracts and Financial Intermediation with Costly Screening. The *Canadian Journal of Economics,* 31(3), 573-595.

Williamson, S.D. (1986). Costly Monitoring, Financial Intermediation and Equilibrium Credit Rationing.*Journal of Monetary Economics*, 18, 159-179.

Xu, Z. (2000). Financial Development, Investment and Economic Growth. *Economic Inquiry*, 38(2), 331-344.

The Role of Small and Medium Enterprises (SMEs) Loans on Employment Generation: Bangladesh Perspective[*]

Mohammad Masuduzzaman[1]

Farida Parveen[2]

Dr. Shamim Ara[3]

Mafuza Akther[4]

Abstract

This study examines the contributions of bank loans to Small and Medium Scale Enterprises (SMEs) in employment generation in Bangladesh. This is because the sector serves as a catalyst for employment generation, poverty reduction and economic development as well. The aim of this study therefore; is to find out the relationship between employment and SME Financing. Using panel data analysis with a sample of 310 enterprises for the period 2009-2011, the paper shows that SME loans has a positive impact on employment generation.

Keywords : Small and Medium-Scale Enterprises (SMEs), Bank Loan, Employment, Panel data analysis, and Bangladesh.

JEL Classification: C23, E24, G21, L25, O53.

[*] The views expressed in the paper are authors' own and do not necessarily reflect the institutional views.

[1] Deputy General Manager (Research), BB

[2] Deputy General Manager (Research), BB

[3] Deputy General Manager (Statistics), BB

[4] General Manager (Research), BB

1. Introduction

SME sector has an importance of acting as a platform in the development drive of any economy especially in the areas of job creation, offering significant employment opportunities, empowering the poor and providing assets to enhance poverty reduction. The fight against unemployment or lack of employment opportunities has been one of the key challenges facing Bangladesh economy since independence. Greater part of the country's labor force is employed in agriculture finding no other alternatives in job market. Despite this high dependence on agriculture, other sectors have also been growing significantly in Bangladesh. Over the years, share of agriculture in GDP is declining while manufacturing and service sectors are the drivers of growth. Manufacturing sector in Bangladesh has been contributing at a consistent rate over the last decade to around 15 percent. SMEs in manufacturing and services combined have 19 percent share of GDP (Rabbani and Sulaiman, 2002). A nationwide survey claims that Micro, Small and Medium Enterprises (MSMEs) value addition accounts for 20 to 25 percent of Bangladesh's GDP. These enterprises are accommodating more than 30 million people aged 15 years and above (Daniel, 2003). So SMEs are playing significant contribution in the transition of agriculture-led economies to industrial ones furnishing plain opportunities for processing activities which can generate sustainable source of revenue and enhance the development process in Bangladesh. Nonetheless, the role of SME in employment generation and poverty reduction has been well recognized in the PRSP (GOB, 2002).

SME in Bangladesh is dominated by trading. But the greatest potential of employment creation is among the SMEs involved in manufacturing. The key reasons for SMEs not entering the manufacturing sector are financial constraints and dismal state of utilities (CPD, 2003). So, the role played by small and medium enterprises (SMEs) in employment generation and economic development is a key question for policy makers. Many empirical studies find that the share of SMEs in GDP is significantly higher in high income countries. A cross country study (Ayyagari et al, 2003) shows that SMEs account for over 51 percent of GDP and 57 percent of employment in high income countries while the corresponding figures for low income countries are 16 and 18 percent. This also reveals the importance of SME in growth and employment generation.

Small and Medium Enterprises (SMEs) have come to the limelight in the financial sector on account of their contribution in generating employment, reducing poverty and fostering economic growth and yet limited access to finance. Both Micro Finance Institutions (MFIs) and banks are beginning to realize the potential of this market and

designing new financial products for it. SMEs in Bangladesh mostly require financing for three purposes – for start-up capital, for working capital and for fixed capital. Unavailability of working capital from formal financial institutions is recognized as one of the major complaints of SMEs in Bangladesh (Meagher, 1998). Mostly they rely on personal savings or retained earnings in the case of those who are already in operations. To develop SMEs, Bangladesh Bank has introduced several schemes and programs to ensure institutional financial services for the SMEs. They include credit wholesaling by using the grants received from different development partners, opening of 'Dedicated Desk' and 'SME Service Centre' in the banks and special services for the women entrepreneurs.

This study tries to examine the contributions of formal SME financing i.e. bank loans towards employment generation in Bangladesh. In this regard, the main aim of this study is to find out the relationship between employment and SME loans and to provide some policy suggestions. The remainder of paper is structured as follows. After introduction the second section describes the literature review. The third section reviews a snapshot of SME sector of Bangladesh. The fourth section presents methodology. The fifth section shows empirical results of the study. The last section depicts conclusion.

2. Review of Literature

Due to the important role in GDP growth, new job creation and entrepreneurship development Small and Medium sized Enterprises (SMEs) are acknowledged worldwide as the drivers of socio-economic growth. A growing body of empirical literature supports the fact that SMEs are crucial contributors to total employment and job creation in developed and developing economies. There is a general agreement among scholars and policy makers that the key advantage of the sector is its employment potential at low capital cost. But challenge for SMSs are lack of start-up capital, high financing cost and banks' reluctance to provide loans for fixed and working capital.

Birch (1979) provided early evidence that supported the notion that SMEs are the primary engines of job growth. His findings showed that 81.5% of all net new jobs in the United States during 1969–1976 were created by firms with 100 or fewer employees.

Kirchhoff and Phillips (1988) examined the contribution of small and large firms to U.S. job growth and found that firms with fewer than 100 employees are the major sources of new job creation. In contrast, firms with more than 1,000 employees provided only 13 % of all new jobs despite having a 37% share of employment.

OECD (2004) estimated that SMEs account for 60 to 70% of jobs in most OECD countries, with a particularly large share in Italy and Japan and a relatively smaller share in the United States. Throughout, SMEs account for a disproportionately large share of new jobs, particularly in countries that have displayed a strong employment record.

According to Berrios and Markus (2013), small and medium-sized enterprises (five to 250 employees) generate a large share of jobs in industrialized countries. Moreover, these jobs are with existing companies and with newly created firms, particularly those that grow rapidly in the first years of operation.

A recent research by Ayyagari, Demirguc-Kunt, and Maksimovic (2011) investigates the contribution of small firms to employment, job creation, and growth in developing countries. They presented a unique cross-country database on the contribution of SMEs to total employment, job creation, and growth across 104 developing economies. They find that while small firms (<20 employees) have the smallest contribution to aggregate employment compared to medium (20-99 employees) and large firms (100+ employees), SMEs (<99 employees) are comparable to large firms in their contribution to aggregate employment. They also showed that SMEs are the largest contributors to total job creation across developing countries and have the largest share of employment, accounting for 71% of jobs in the region. SMEs not only do employ the largest number of people, they also generate most new jobs.

The International Labor Organization (ILO) and the German Agency for International Cooperation (GIZ) recently published a study titled 'Is Small Still Beautiful?' (2013). A literature review of recent empirical evidence on the contribution of SMEs to employment creation examined almost 50 studies. The review concluded that SMEs provide two-thirds of all formal jobs in developing countries in Africa, Asia, and Latin America, and 80% in low-income countries, primarily Sub-Saharan Africa. Similarly, more important than holding the majority of jobs in low-income and emerging economies, SMEs make a key contribution to net job creation, particularly smaller and young firms.

Das and Kalita (2009) worked on labor-intensive sectors to find out generation of employment in India. They attempted to address what constraints to decline the labor intensity in India. Using primary survey data from different manufacturing firms (apparel, leather, gems & jewelers, sports and bicycles) during 2005-2006, the study reveals that the constraint factors reduced the employment generation in labor intensive

firm. The study identified several problems i.e. lack of skilled workers, week infrastructure, poor investment, rigid labor rules and regulations and imperfect export markets which decline the generation of employment of that firms. So, they suggested a set of policies to enhance the potential generation employment of those manufacturing sector.

Asma Benzazoua Bouazza (2015) examines the current developments of small and medium-size enterprises (SMEs) in Algeria and investigates the contribution of those enterprises to economic development and employment creation. The analysis shows that the Algerian SME sector contributes to 40% of the country's GDP and employs only 18.4% of the active population. However unemployment remains high, particularly among young Algerians.

Dr. Kadiri (2012) examines the Contributions of Small and Medium Scale Enterprises (SMEs) to employment generation in Nigeria. By using Binomial Logistic Regression the study observes that the sector was unable to achieve this goal due to its inability to obtain adequate business finance for the sector. It was observed that virtually all the SMEs that were sampled relied on the informal sources of finance to start their business. As a way out, the study suggests the need for the integration of the activities of the formal with that of the informal financial institutions.

Abdulsalam and Tukur (2014) investigate the effect of microfinance on growth of small enterprises in Sokoto State, Nigeria. A stratified sampling method is used to select the sample of 120 firms to elicit the information for the survey. By using linear regression, two hypotheses were tested in their study. One shows that, positive and significant relationship exists between access to microcredit and value of physical assets of the firms. Another also shows a positive statistical relationship between access to micro-credit and employment generation. The study concludes that, accessed micro-credit have grown in terms of both physical assets acquired and employment generated. It, therefore, recommends that microfinance banks should consider an upward review of the size of loan offered to small businesses to enable the enterprises have enough funds to finance their operations.

Alam and Ullah (2006) showed in their article that, Small and Medium Enterprises (SMEs) are accounting for 25 percent of GDP, 80 percent of industrial jobs, and 25 percent of the total labour force in Bangladesh even though the sector gets negligible facilitation from different support service providers. They identified various constraints that hinder the development of SMEs in Bangladesh, such as lack of medium to long-

term credit, limited access to market opportunities, technology, and expertise and business information. Lack of suitable incentives, inefficient and limited services from relevant government agencies as well as poor capacity of entrepreneurs are other reasons for the slow growth of SMEs. They suggested that the government has many things to do to flourish the SMEs because, if they flourish, SMEs will create new entrepreneurs, generate more jobs and contribute to a great extent to the national economy.

Rabbani and Sulaiman (2002) looked at the performance of small and medium enterprises that have received loans from Brac Bank Limited with a focus on employment generation. Their analysis reveals that employment generation is higher in enterprises with longer association with the Bank, enterprises in the manufacturing sectors and enterprises with a high initial labor force. Moreover, employment generated after repeat loans has a greater positive impact on the wage bill when compared to employment generated after first loans.

We conclude from the existing literature that SMEs are the key driver of economic growth and employment generation in both developed and developing economies. Moreover, SMEs make a significant contribution to exports earnings, technology assimilation, skills development, and innovation stimulation. Even such contributions vary among different countries and regions. A number of literatures in previous studies have identified factors affecting SMEs' growth and expansion such as competition, finance, technology etc. However the role of SMEs in generation of employment has in most cases been focused. SMEs face a lot of challenges specially lack of start-up capital that substantially hinder their progress, growth and subsequently their contribution to economic development. Financing SMEs as a core business is still relatively new for formal financial providers in Bangladesh. Therefore this study puts more importance to identify the contributions of bank loans to Small and Medium Scale Enterprises (SMEs) in employment generation in Bangladesh which makes it different from existing literature.

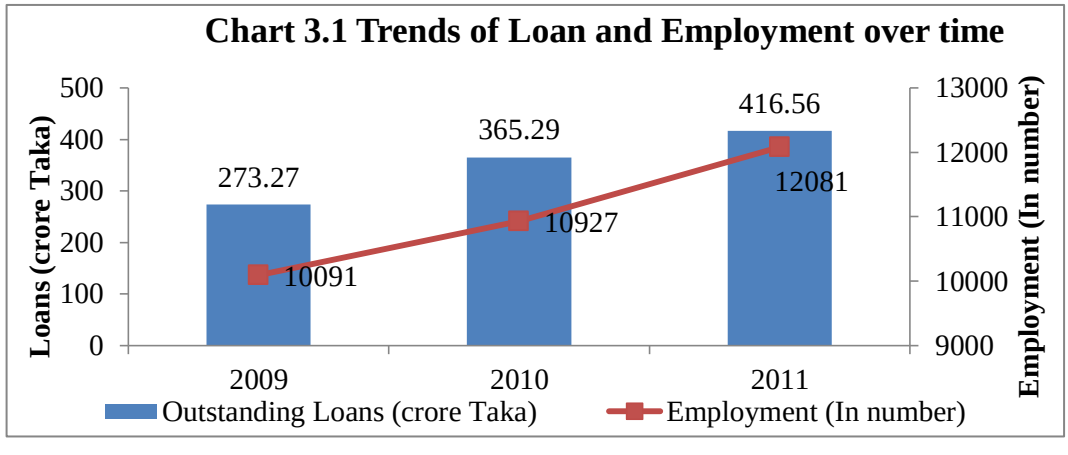
3. Snapshot of SME sector in Bangladesh

In recent years, the SME sector has consistently registered higher growth rate compared to the overall industrial sector globally. There is a general agreement among scholars and policy makers that the major advantage of the sector is its employment potential at low capital cost. A developing country like Bangladesh, the SMEs are considered as the engine of growth. The SME entrepreneurs in both the urban and rural areas of Bangladesh are now making a crucial progress in national development. In Bangladesh,

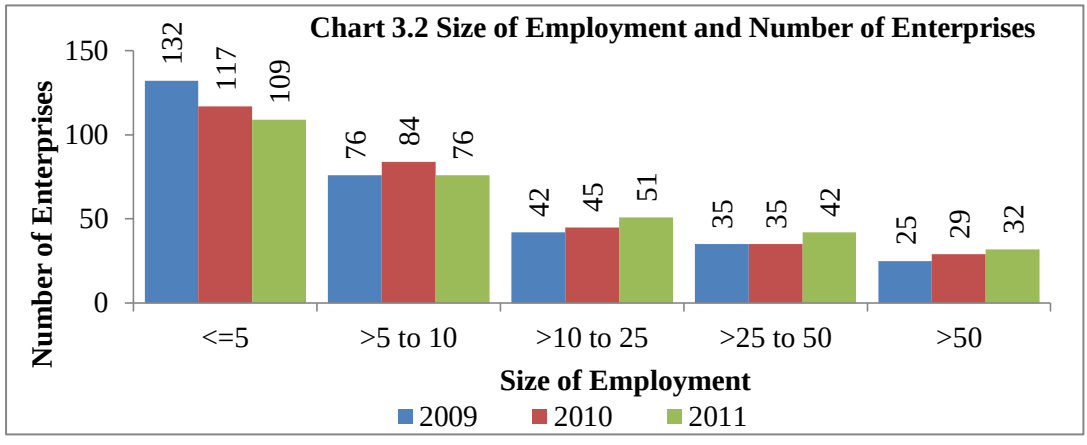
poverty alleviation through economic growth as well as employment generation on mass scale is heavily dependent on the development and expansion of SMEs.

Similarly, the loans for the SME sector has continuously recorded higher growth rate compared to the overall credit growth to industrial sector in recent years. Such high growth in SME loans in the recent past was one of the concerns in monitoring credit situation of Bangladesh. In addition, it was a widespread belief that SME loans disbursed to industries had been diverting to unproductive sectors as investment in stock market and housing sector, etc. On that background, Bangladesh Bank (2016) made an in-depth analysis to find causes of high growth of industrial loans and its economic impact through a field survey of 451 enterprises financed by banks and financial institutions in 2012. It found that changes both in manpower and capital of surveyed enterprises over the years indicating transformation of small to medium sized enterprises. Loans not only generate regular funding of existing borrowers but also create opportunities of being new entrepreneurs. In case of generation of employment, small sized and/or manufacturing enterprises contribute the most.

However, this study attempts to find the relationship between SME loans and employment in Bangladesh in the light of that survey data and uses a sub sample of 310 enterprises for the period 2009-2011 and applies panel data analysis. The trends of loans received and employment created by this sample enterprise are shown in Chart 3.1.

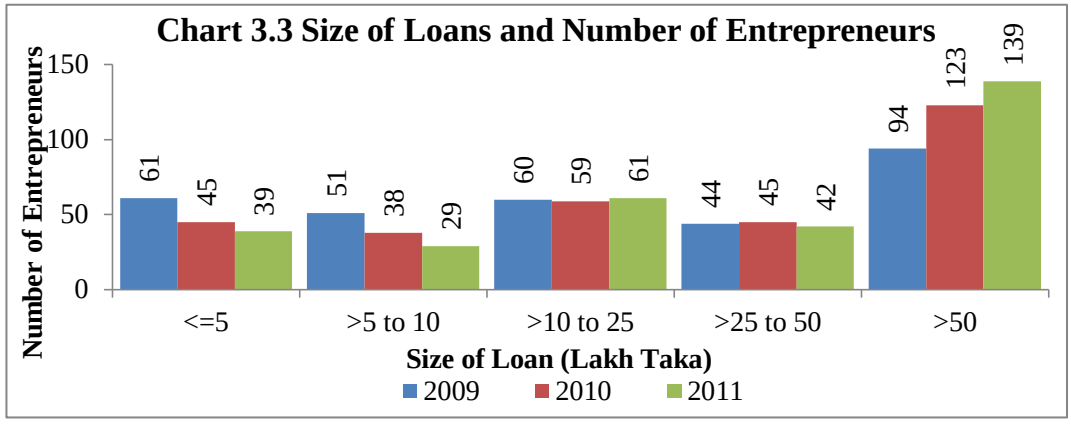


Analyzing the data of loan and employment for 310 SMEs in Bangladesh during 2009 to 2011, we have observed a positive relationship among the loan (outstanding) and employment where both the loan and employment have increased over the time. The amount of outstanding loan was increased by 33.67 percent to Taka 365.29 crore[5] in 2010 and 14.04 percent to Taka 416.56 crore in 2011 as compared to the previous year (chart 3.1). Accordingly, the number of employment also increased by 8.28 percent and 10.56 percent in 2010 and 2011 respectively in comparison with the previous year.



Considering the size-wise loan and employment of 310 surveyed SMEs, it was observed that 42.58 percent of the total enterprises had employees up to 5 persons in 2009 (chart 3.2). But this number of enterprises had declined gradually and stood at 35.16 percent in 2011. On the other hand, 8.06 percent of the enterprises had employees for more than 50 persons in 2009. But this number of enterprises had increased gradually to 10.32 in 2011. Therefore, the study showed that enterprises were creating more employment opportunities over the time and there happened shifting of small to medium enterprises.

[5] One crore = 10 million



Considering the size-wise loan of 310 surveyed SMEs, it was observed that 19.68 percent of the total entrepreneurs had outstanding loans worth of Taka 5 lakh[6] or less (chart 3.2). But number of entrepreneurs in this loan category had declined gradually and stood at 12.58 percent in 2011. On the other hand, 30.32 percent of the total entrepreneurs had outstanding loan above Taka 50 lakh in 2009. But number of entrepreneurs in this loan category had increased gradually to 44.84 percent in 2011. Therefore, the study showed that the entrepreneurs had taken more loans over time and hiring more employees to expand their business activities and hence contributing to more employment with taking higher amount of loans over the time.

4. **Research Methodology**

The study is based on the data collected from field survey conducted by Bangladesh Bank to make an in-depth analysis for causes of high growth of industrial loans and its economic impact through a field survey of 451 enterprises which borrowed from banks and financial institutions in 2012.In this regard this report attempts to find the relationship between SME loans and employment in Bangladesh.

Test Hypothesis

For the objective of this study is tested through the null hypothesis which is stated that is no significant relationship between SME loans and employment in Bangladesh.

Method

We apply panel data regression to test null hypothesis and use a sub sample of 310 enterprises of that survey. The data are used for the period 2009-2011.

Fixed Effects

The fixed-effects (FE) model is used to find out the relationship between employment and loans variables within an enterprise over time. FE model is based on the assumption

[6] One lakh = 0.10 million

that each enterprise is different. So an enterprise's error term and constant are not be correlated with the other one.

The equation for the fixed effects model becomes:

$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}$

where

α_i(i=1….n) is the unknown intercept for each enterprise (*n th* enterprise-specific intercepts).

Y_{it} is the employment of *i th* enterprise at time *t*,

X_{it} represents loans of *i th* enterprise at time *t*,

β_1 is the coefficient for loans,

u_{it} is the error term

The error term u_i is the cross section or individual specific error component

Random Effects

The rationale behind random effects (RE) model is that the variation across enterprises is assumed to be random and uncorrelated with loans included in the model. In RE consider those individual characteristics that may or may not influence employment. An advantage of RE is that time invariant variables are included and these variables are absorbed by the intercept in the fixed effects model.

The random effects model is :

$Y_{it} = \beta X_{it} + \alpha + v_{it} + \varepsilon_{it}$

$= \beta X_{it} + \alpha + w_{it}$

where

α_i(I =1….n) is the unknown intercept for each enterprise (*n th* enterprise-specific intercepts).

Y_{it} is the employment of *i th* enterprise at time *t*,

X_{it} represents loans of *i th* enterprise at time *t*,

β_1 is the coefficient for loans,

w_{it} is the composite error

The composite error tem (w_{it}) is consist of two components— v_i , the cross section or individual specific error component and ε_i , the combined times and cross section error component.

Fixed or Random: Hausman test

To decide between fixed or random effects, a Hausman test is needed to run where the null hypothesis is that the preferred model is random effects versus the alternative the fixed effects (Green, 2008, chapter 9). It basically tests whether the unique errors (u_i) are correlated with the regressors, the null hypothesis is they are not.

5. **Findings of the study**

The results of the relationship between employment and SME loans based on both fixed effects (FE) and random effects (RE) methods are shown in table 5.1. Table 5.1 shows that both FE and RE methods establish relationship between loans received and employment generated by SMEs. In fixed effects results the coefficient of this linear relationship is positive and its value is 0.03 and standard error 0.0024. The p-value (0.000) indicates relationship between SME loans and employment of the enterprises is significant at 1% level. Therefore, a positive statistical relationship exists between SME loans and employment. However, the value of F Statistic is 24.79 which is statistically significant at 1% level and shows that the model is acceptable. The adj. R^2 is 88.8% which reveals that a statistically a good fit of the relationship.

Table 5.1 Regression results on Employment Generation with SME Loans

EMPOYMENT	FE			RE		
	Coefficient	Std. Error	P-value	Coefficient	Std. Error	P-value
SME LOANS	0.027197*	0.002439	0.0000	0.029670*	0.002353	0.0000
C	32.50477	0.349914	0.0000	32.22421	2.508636	0.0000
Adj. R-sq.	0.888106			0.143570		
F-stat.	24.78560			156.7349		
P-value (F-stat.)	0.000000			0.000000		
Hausman (Chi-sq. Stat.)	8.565661*					

* Indicates significant at 1% level.

On the other hand, the random effects results show that the coefficient and standard error of the linear relationship is also the same as fixed effects results. The p-value (0.000) of the coefficient indicates relationship between SME loans and employment of the enterprises is significant at 1% level. Therefore, a positive statistical relationship exists between SME loans and employment. However, the value of F Statistic is 156.73 which is statistically significant at 1% level and shows that the model is acceptable. But the adj. R^2 is 14.35% which reveals that a statistically a poor fit of the relationship.

While choosing the preference between FE and RE results, we tested Hausman Test. We found that the value of chi-square is 38.56 which is significant at 1% level. This indicates that FE is appropriate.

6. Conclusion and Recommendations

The objective of the study was to find out the relationship between SME loans and employment generation. By applying a panel data analysis, we found that there is positive relationship between SME loans and employment. The findings of this research work will go a long way in the further development of the SME sector in Bangladesh, whereby barriers against access to finance will be eliminated and job creation will be enhanced. Banks and Non Bank Financial Institutions (NBFIs) may play greater role in search of potential SME entrepreneurs. Since trading sector needs more loans for purchasing goods for sale but employs few workers, banks and NBFIs can provide SME loans to the entrepreneurs of the industrial sector which can generate more employment. In case of disbursing loans, Banks and NBFIs can prioritize small sized enterprises because they have ample opportunities to expand their business activities through loans. Banks and NBFIs can also create new entrepreneurs through providing loans. In this regard, employment will be generated in self-employed process.

References

Abdulsalam, D.O. and Tukur, M.N. (2014), "Access to Microfinance and Small Enterprise Growth in Sokoto State, Nigeria", World Review of Business Research, Vol. 4, No.1, PP. 62-75.

Alam, M. S. and Ullah, A. M. (2006), "SMEs in Bangladesh and Their Financing: An Analysis and Some Recommendations", The Cost and Management, Vol. 34, No.3, Pp.57-72.

Asma Benzazoua Bouazza (2015) Small and Medium Enterprises as an effective sector for economic development and employment creation in Algeria, International Journal of Economics, Commerce and Management , United Kingdom , Vol. III, Issue 2, Feb 2015

Ayyagari, Demirguc-Kunt, and Maksimovic (2011).Small vs. Young Firms across the World: Contribution to Job Creation, Employment and Growth, Policy Research Working Paper 5631.The World Bank Development Research Group Finance and Private Sector Development Team 2011.

Ayyagari, M., Beck, T. and Demirgu-Kunt, A. (2003), "Small and Medium Enterprises across the Globe", World Bank Policy Research, Working Paper No. 3127.

Bangladesh Bank (2016), " A Survey Report on an Enquiry into the Causes of High Increase in Loans to the Small and Medium Enterprises (SME) and Its Economic Impact", Special Research Report, srw1601.

Birch, David L. (1987), Job Creation in America: How Our Smallest Companies Put the Most People to Work, Free Press, New York.

CPD (2003), "Industrial Policy, Privatization and SME", National Policy Review Forum, Centre for Policy Dialogue, Bangladesh.

Das, D.K. and Kalita, G. (2009), "Are Labour-Intensive Industries Generating Employment in India? Evidence from Firm Level Survey", The Indian Journal and Labour Economics, Vol. 52, No.3.

Dr. Ismaila Bolarinwa Kadiri (2012), Small and Medium Scale Enterprises and Employment Generation in Nigeria: The Role of Finance, Kuwait Chapter of Arabian Journal of Business and Management Review Vol. 1, No.9; May 2012

Government of Bangladesh (GOB) (2002), A National Strategy for Economic Growth, Poverty Reduction and Social Development, Economic Relations Division, Ministry of Finance, Government of the People's Republic of Bangladesh.

Greene, William H. (2008). "Econometric Analysis", 6th Edition, Upper Saddle Rive, NJ: Prentice-Hall.

Kirchhoff, Bruce and Bruce Phillips,(1988).The Effect of Firm Formation and Growth on Job Creation in the United States, Journal of Business Venturing 3, 1988, 261-272.

Mario Berrios , Markus Pilgrim (2013). SMEs and Job creation: Is Small Still Beautiful? International Labor Organisation , ILO's Small Enterprises Unit.

Meagher, P (1998), "Secured Finance for SMEs in Bangladesh", Job Opportunities and Business Support (JOBS) Program, USAID, Institutional Reform and the Informal Sector (IRIS) (Maryland, USA: University of Maryland at College Park.

Mehnaz Rabbani and Munshi Sulaiman (2002), Financing SMEs and its Effect on Employment Generation: A Study of Brac Bank's SME Lending, Research and Evaluation Division www.bracresearch.org

OECD (2004), "Promoting Entrepreneurship and Innovative SMEs in Global Economy: Towards a More Responsible and Inclusive Globalization", Conference of Ministers Responsible for Small and Medium Sized Enterprises Istanbul, Turkey 3-5 June 2004.

Exchange Rate Movement and International Reserve Position in the Floating Exchange Rate Regime of Bangladesh

Mohammad Mohidul Islam[1]

Abstract:

This study has tried to examine the exchange rate performance on the reserve accumulation of Bangladesh in the floating regime. Using quarterly time series data (2003-2018), this paper has attempted to explore the influence of exchange rate on foreign exchange reserves by employing standard econometric techniques in Bangladesh economy. The findings of the empirical analyses reveal that the foreign exchange reserves have no statistically significant response to the exchange rate movements, but the expected positive sign in the coefficient of exchange rate gives some useful insight like that there may be an economic implication. On the other hand, lag inflation has a significant negative interface on reserve growth and foreign direct investment inflow growth has a significant positive influence on reserve growth. The effect of the rest of the other variables on reserve growth is not statistically well justified. In the end, it may be concluded that although the nominal exchange rate changes and reserve growth relationship is not empirically established; however, from the economic point of view, the floating exchange rate regime has an important implication on the macroeconomic behavior of Bangladesh economy.

Keywords: Exchange Rate, Floating Regime, Foreign Exchange Reserves, Bangladesh.

JEL Classification: C22, E31, F21, F24 and F31.

[1] The Author's is Joint Director, Statistics Department, Bangladesh Bank, E-mail: mmistatcu@gmail.com mohammad.islam@bb.org.bd

1. Introduction:

Exchange rate[2] designates the comprehensive position of the country's economy from the global perspective. Every country's economic development is intimately associated with its foreign exchange system. The foreign exchange rate is a crucial component of the country's economic activities mainly in the foreign trades. Bangladesh has continued the floating exchange rate system[3] since May 2003. After that, Bangladesh Bank (Central Bank of Bangladesh) pursued a flexible but managed float exchange rate policy strategy. Under the Floating regime, the exchange rate is basically determined by the country's overall demand for foreign currency and supply of foreign currency and moreover, this demand and supply of foreign currency are also influenced by some other economic factors. By the definition of International Financial Management theoretically, demand for foreign currency is determined by various factors, namely, import payments, service payments, including income payments, debt service payments, and outward foreign investment. The supply of foreign currency is aggregated of export receipt, service receipts, including income receipts, debt service receipts, inward foreign aid, and inward foreign investment.

The de jure (officially) exchange rate regime in Bangladesh maintains a floating exchange rate system. In this floating system, reserves are projected to reveal relatively low volatility with high nominal exchange rate volatility. This has led the nominal exchange rate to linger almost fixed or to move within a very narrow range for the period. Particularly, it is found that in the de facto exchange rate regime of Bangladesh, there was never completely free floating. Rather than this Bangladesh pursued a managed floating system from the early of its transition to the floating regime which is also known as a dirty float. Conceptually, it is similar to a freely floating system, moreover, in that exchange rate, there are no official boundaries and are allowed to fluctuate on a daily basis. On the other hand, it is similar to a fixed rate system in the sense that governments can and sometimes do intervene to prevent their currencies from a sharp fall.

Formally, based on demand-supply interaction the exchange rates of Taka for inter-bank and customer transactions are set by the dealer banks. The central bank is not in the market on a day-to-day basis and undertakes USD purchase or sale transactions with

[2] Exchange rate refers to the nominal exchange rate in this paper.

[3] Floating exchange rate system can be of two types. One is freely/clean floating that means exchange rate is fully determined by the market without any interventions. Another is managed/dirty floating where intervention in the foreign exchange market is undertaken which means the exchange rate is not fully determined by the market.

dealer banks at existing inter-bank exchange rates only as required to maintain systematic market situations. These inter-banks exchange rates that are also regarded by BB for purchase and sale various transactions with the different international organizations including government. However, Bangladesh Bank intervenes in foreign exchange markets in order to reduce instability in the exchange rate of the BDT to other currencies by buying or selling foreign currencies in the domestic market. One example can be placed that during the FY2014, BB packed monthly average exchange rates of the Taka to the USD in a relatively narrow band between 77.63 and 77.75; by purchasing amounted to more than USD 5 billion from the domestic market. Exchange rate policy in Bangladesh is mainly demonstrated by intervention in the foreign exchange market. On the backdrop of the rapid rise of foreign exchange reserves, the central bank feels the pressure of keeping the exchange rate fixed under the managed float exchange rates and, thereby, intervenes in the foreign exchange market.

As per Bangladesh Bank order, 1972, the central bank has been established to manage the monetary and credit system of Bangladesh in stabilizing domestic monetary value and maintaining the external competitiveness of the local currency in enhancing growth and development by productive resource mobilization. According to Foreign Exchange Regulation Act, 1947, to uphold a viable external parity value of the Bangladesh Taka, Bangladesh Bank as the central bank of the country, controls the foreign exchange on behalf of the government. After becoming independent in 1971, at the earlier stage Bangladesh had been upholding various pegged exchange rate[4] regimes, mainly pegged to the British pound sterling (1972-1979). Over the period 1980-1982, the exchange rate was pegged to a major trading partners' currency basket with the pound sterling as the intervening currency and then for a long period 1983-1999, it was pegged to a major trading partners' currency basket with the US dollar as the intervening currency. After that for a short period, the exchange rate passed an adjustable pegged system (2000-2003). Bangladesh then moved to a floating exchange rate system on May 31, 2003.

Foreign exchange reserves[5] have been accumulating in Bangladesh for the last couple of years, particularly, since 2010 and now it has crossed US$ 30 billion. Improvement of current account and financial account balance stemming from the increase in export and remittance inflows, low imports from sluggish investment demand and availability of

[4] In the pegged exchange rate system, the value of domestic currency is moved in line with the pegged foreign currency. Another exchange rate system is the fixed exchange rate system where the exchange rate remains constant or moves within small bands.

[5] Foreign exchange reserves mean gross official reserves.

low-cost foreign financing facilities significantly contributes to the pile up of reserves in Bangladesh. Foreign exchange reserves have now reached US$ 32.94 billion (June 2018) which can meet about nine months of import payment, while in June 2003 it was only US$ 2.47 billion. Considering the paramount importance of the exchange rate system in the economy, it is required to conduct a comprehensive study in order to unveil the exchange rate movement and reserve accumulation relationship.

2. Literature Review:

Younus and Chowdhury (2006) focused to assess Bangladesh's evolution to the floating regime and its impact on macroeconomic variables. They observed that economic growth in Bangladesh performed well in the transitional and floating exchange rate systems. Inflation is lower in the transitional regime regardless of the larger money supply and exchange rate depreciation. They also emphasized that currency depreciation increased export growth in the floating regime.

Priyo (2009) analyzed whether the floating exchange rate system has any shock on the value of Bangladesh Taka i.e. does it make any drop in the value of the currency. He verifies that switching to the floating regime has no statistically significant effect on the value of Bangladesh currency when the foreign exchange reserve is considered in the regression model.

Yu and Lili (2011) tried to examine the relationship between reserves and exchange rate using monthly data for the period 1994 to 2011 by applying the Johansen test in the case of China. The results of the study focused that there exists a long-term relationship between reserves and exchange rates. They also concluded that the flexibility of the exchange rate of RMB slows down the accumulation of reserves.

Gokhale and Raju (2013) explored to find out the causal relationship between the exchange rate and foreign exchange reserves in India using time series data from 1980 to 2010. This study concluded that no long-term and short-term relationship exists between the exchange rate and foreign reserves.

Tariq et al. (2014) revisited the relationship between reserves and the real exchange rate considering the mercantilist approach using the sample period 1972 to 2008. They indicated that export growth through real exchange rate depreciation boost up reserves and stated that switching to the floating regime also stimulates reserve accumulation.

Bayat et al. (2014) found the causal relationship running from foreign reserves to

exchange rate using monthly data from 2003 to 2014 in Turkey. The findings of the study also concluded that the real exchange rate has been considered by the Turkish central bank under the inflation-targeting regime.

Kalu et al. (2019) investigated the responsiveness of foreign reserves to exchange rate by employing the ARDL model in the Nigerian economy using time series data from 1996 to 2016. This study found reserves show a positive and significant response to the real exchange rate, whereas the reserves and nominal exchange rate association are positive but not significant.

After reviewing the literatures, no prior study is found that attempted to investigate the responsiveness of foreign reserves to exchange rate in Bangladesh. Therefore, a comprehensive study is required that will take a modest effort to examine the reserves and exchange rate relationship for the floating exchange rate regime in Bangladesh.

3. Scope and Objective of the Study:

Transition to the floating exchange regime was a policy reform issue and there were some debates about the competence of Bangladesh Bank from several corners. However, Bangladesh Bank performed remarkably. There was no instability, so that there were no speculations about price and the market behaved rationally. If we consider the market information, we discover that the major macroeconomic indicators have positive movements over the period. Apart from the different studies on the relationship between exchange rate and international reserves, in the context of Bangladesh, there is no proper study conducted that explored the relationship in this ground extensively. Therefore, this analysis is a modest attempt to investigate the stated issue in the floating exchange rate regime of Bangladesh.

The main concentration of this study is to uncover the role of exchange rate in the accumulation of reserves after switching to the floating regime. This paper tries to assess the influence of exchange rate on the foreign exchange reserves movement in the economy. To examine the floating regime performance on the reserves accumulation, this work is implicitly carried out based on the following research question: does exchange rate fluctuation have any significant impact on international reserve accumulation in the floating regime of Bangladesh.

4. Data and Methodology:

To attain the aims of the study, secondary data have been used to examine the influence of exchange rate along with other variables on foreign exchange reserve. The empirical

analysis is conducted using quarterly time series data from 2003 to 2018. The data have been collected from Bangladesh Bank (BB), Bangladesh Bureau of Statistics (BBS) and other organizations. The empirical analysis is performed employing standard time series econometric techniques. The statistical software STATA has been used to carry out the analysis.

The econometric specification is dynamic in nature, and the Arellano-Bond first differences estimator (Arellano and Bond 1991) type specification is modeled for depicting the empirical relationships among the variables of interest. The econometric specification considers the influential variables commonly used in the literature together with the exchange rate and commodity prices, which is given by:

$$Fxrg_t = \alpha_0 + \alpha_1 Fxrg_{t-1} + \alpha_2 \text{Exr}_t + \alpha_3 Inf_{t-1} + \sum_{i=0}^{1} \alpha_{4i} Remg_{t-i} + \sum_{i=0}^{1} \alpha_{5i} Rgdpg_{t-i} + \sum_{i=0}^{1} \alpha_{6i} Trbg_{t-i} + \sum_{i=0}^{1} \alpha_{7i} Fdiing_{t-i} + \alpha_8 TT + \varepsilon_t$$

Where,

Fxrg = Foreign Exchange Reserve Growth

Exr = Nominal Exchange Rate[6]

Inf = CPI Based Inflation[7]

Remg = Worker Remittance Growth

Rgdpg = Real Gross Domestic Product Growth[8]

Trbg =Trade Balance Growth

Fdiing= Foreign Direct Investment Inflow Growth

TT = Time Trend Variable

ε = Disturbance Term

In time series analysis, the macroeconomic variables often have the non-stationary problem, while the observed relationship does not tell the true relationship. In order to resolve this problem, we can consider a time trend variable for specifying the relationships. This is why, a deterministic time trend variable (TT) is utilized as an explanatory variable in the empirical relationship, and more specifically, a time trend

[6] Nominal exchange rate is expressed in terms of BDT to US$.

[7] Consumer price index is calculated using base year 2005-06=100.

[8] Quantum index of medium and large-scale manufacturing Industries (Base: 2005-06=100) is used as the proxy of real gross domestic product.

variable (TT) is included to capture any drift in the measure that is not explained by the macroeconomic relationship. The specified model is estimated using Ordinary Least Square (OLS) and Auto Regressive Distributed Lag (ARDL) by fixing lags methods. After estimating the parameters, econometric analyses are also performed employing Breusch Godfrey LM test, White's test, and Skewness/Kurtosis test in order to investigate the autocorrelation, heteroskedasticity and normality assumption respectively.

5. Findings:

In this study, we checked the stationarity property of the variables using time plots instead of using the tests of stationarity. In practice, the shape of the time plot may identify the nature of the time series variable as to whether it is stationary or not. From the time plots of different variables (See Appendix 1), we may state that all the variables are stationary in nature except the nominal exchange rate.

The following table shows the findings of OLS and ARDL estimations of the model.

Dependent Variable: Fxrg		
Regressor	**OLS Regression**	**ARDL Regression**
Fxrg (Lag 1)	0.2032 (0.1311)	0.1976 (0.1339)
Exr	0.5264 (0.3203)	0.0238 (0.1462)
Inf (Lag 1)	-1.3364*** (0.4715)	-1.1008** (0.4619)
Remg	0.0127 (0.1003)	0.0480 (0.1005)
Remg (Lag 1)	-0.0529 (0.1026)	-0.0190 (0.1029)
Rgdpg	-0.2081 (0.1547)	-0.2401 (0.1569)
Rgdpg (Lag 1)	0.0508 (0.1618)	0.0375 (0.1651)
Trbg	-0.0090 (0.0156)	-0.0106 (0.0159)
Trbg (Lag 1)	-0.0216 (0.0150)	-0.0223 (0.0153)
Fdiing	0.0135**	0.0134**

	(0.0061)	(0.0063)
Fdiing (Lag 1)	-0.0086 (0.0068)	-0.0092 (0.0069)
TT	-0.2312* (0.1318)	
Adjusted R^2	0.2159	0.1823
No. of Observations	59	59

Source: Author's calculation using STATA 14 version.

Note: ***, ** and * indicate the 1% , 5% and 10% level of significance respectively.

In OLS and ARDL estimation techniques, the coefficients of exchange rates are not statistically significant, but show the expected positive sign, which means that to some extent it has economic implications. Inflation and reserve growth relationship show statistically significant inference i.e., a 1% increase in one period lagged inflation is associated with a 1.1 % decrease in reserve growth. FDI inflow also has a significant association with reserve growth i.e., a 1% increase in FDI inflow growth is associated with a 0.013 % increase in reserve growth. All other variables influence on foreign reserve are not statistically well justified. In the ARDL estimation, the estimated residuals are free from autocorrelation and heteroskedasticity problem; moreover, the estimated residuals also follow the normal distribution (See Appendix 2).

In general, there is an economic linkage between exchange rate changes and reserve growth. Although these relationships are not statistically significant, the expected positive sign indicates the economic influence. Conversely, an increase in the percentage of one lag inflation has a negative effect on reserve growth and an increase in the percentage of FDI inflow growth has a positive effect on reserve growth in Bangladesh.

6. Policy Implications:

The evidence from the empirical study shows no significant statistical relationship exists between exchange rate movements and reserve accumulation, while the inflation and reserve association; FDI inflow and reserves association are found to be significant. Based on these findings, the following policy measures could be suggested.

1. Inflationary movements should be controlled in the accumulation of higher reserves. Inflationary pressure can be controlled by the central bank through their monetary policy instruments. In Bangladesh, inflationary pressure comes not only from demand-side factors, but also from supply-side factors; that is why the fiscal authority or the government should take appropriate initiatives parallel with the monetary authority for reducing inflationary movements.

2. Foreign direct investment inflow should be enhanced for stable reserves growth. In order to attract FDI inflows, the country should have political stability, integrated financial system, and well-facilitated special purpose economic zone.
3. Monetary policy should aim at minimizing extensive fluctuations in the exchange rate that may reduce speculative attacks and undermine the stability of the money demand function. Towards this objective, exchange rate policy should aim at the right balance between necessary flexibility to ensure competitiveness and desire stability to increase confidence in the domestic currency and the underlying fundamentals that provide support to the currency's value over time.

7. Conclusion:

The analytical part of this study illustrates that in light of economic performance as well as an economic point of view to some extent the floating exchange rate regime has a positive effect on the macroeconomic behavior of Bangladesh. In fact, due to some other reasons like the unavailability of high-frequency data and the exclusion of some important variables, such relationships are not statistically justified properly. The enduring exchange rate depreciation along with high inflation is fetching a considerable issue for the regulators and government as well. The foreign currency gap due to demand and supply in the market is getting larger in the high inflationary economy, which leads a nonstop mislays in the value of the local currency. Bangladesh has already graduated into the process of becoming a developing country. As we know in the floating regime, Bangladesh has somehow managed its exchange rate within a small band. In light of the impossible trinity (Mundell-Fleming trilemma[9]), for instance, the economy of Bangladesh can be able to manage the two conditions only[10], namely independent monetary policy and free capital mobility (out of the three conditions) because the country has already given up the fixed exchange rate system. Moreover, in order to enter into a full-phased developed nation status, Bangladesh has to ensure a stable exchange rate policy. The current exchange rate mechanism is neither appropriate nor a sustainable one in supporting the financial market openness as well as a sovereign monetary policy, as the existing exchange rate system is not fully determined by market operations. In this regard, the Government, as well as the central bank, should take the necessary steps to adopt a stable exchange rate policy towards achieving the best-performing economy.

References:

[9] Olivier Blanchard, and David R. Johnson, *Macroeconomics*, Sixth Ed. (Essex: Pearson Education Limited, 2013), pp. 433-435.

[10] Soo Khoon Goh, "Managing the Impossible Trinity: The Case of Malaysia," *MRPA Paper*, No. 18094 (October 2009).

1. Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies , 58* (2), 277-297.
2. *Asian Development Outlook 2016: Asia's Potential Growth.* Asian Development Bank, Manila, Philippines.
3. *Bangladesh Bank Annual Report (2017-2018), Dhaka, Bangladesh.*
4. *Bangladesh Bank Quarterly, Various Issues.* Chief Economist Unit, Bangladesh Bank.
5. Bayat, T., Senturk, M., & Keyhan, S. (2014). Exchange Rates and Foreign Exchange Reserves in Turkey: Nonlinear and Frequency Domain Causality Approach. *Theoritical and Applied Economics , XXI* (11(600)), 27-42.
6. Blanchard, O., & Johnson, D. R. (2013). *Macroeconomics.* Essex:Pearson Education Limited.
7. Goh, S. K. (2009). Managing the Impossible Trinity: The Case of Malaysia. *MRPA Paper* (No. 18094).
8. Gokhale, M. S., & Raju, J. R. (2013). Causality between exchange Rate and Foreign Exchange Reserves in the Indian Context. *Global Journal of Management and business Research finance , 13* (7-C), 7-12.
9. Hossain, M., & Ahmed, M. (2009). Exchange Rate Policy under Floating Regime in Bangladesh An Assessment and Strategic Policy Options. *BIDS-PRP Working Paper Series , Working Paper No. 2*.
10. Kalu, E. U., Ugwu, O. E., Ndubuaku, V. C., & Ifeanyi, O. P. (2019). Exchange Rate and Foreign Reserves Interface: Empirical Evidence from Nigeria. *The Economics and Finance Letters , 6* (1), 1-8.
11. *Monthly Economic Trends, Various Issues.* Statistics Department, Bangladesh Bank.
12. *Monthly Release of Industrial Production Statistics (IPS), Various Issues.* Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Bangladesh.
13. Priyo, A. K. (2009). Impact of the Exchange Rate Regime Change on the Value of Bangladesh Currency. *Social Science Review (Faculty of Social Science, University of Dhaka) , 26* (1), 185-214.
14. Tariq, M., Haq, Z. U., Jan, S., Jehangir, M., & Aamir, M. (2014). Real Exchange Rate and Foreign Exchange Reserves: A Mercantilist View. *Life Science Journal , 11* (3s), 160-174.
15. Vacaflores, D. E., & Kishan, R. (2014). Remittances, International Reserves, and Exchange Regime in 9 Latin American Countries, 1997-2010. *Applied Econometrics and International Development , 14* (2), 97-116.
16. Younus, S., & Chowdhury, M. I. (2006). An Analysis of Bangladesh's Transition to Flexible Exchange Rate Regime. *Working Paper Series: WP 0706, Bangladesh Bank* .
17. Yu, F., & Lili, L. (2011). Does a Correlation Exist Between the Foreign Exchange Reserves and the Exchange Rate. *Master Thesis, Umea School of Business and Economics, Umea University, Sweden*.

Appendix 1: Time Plots of the Different Variables

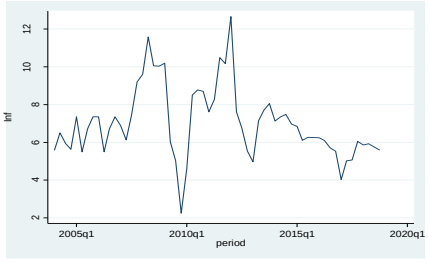


Figure: Time Plots of Inflation

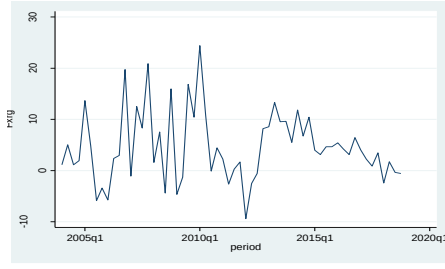


Figure: Time Plots of FX Reserve Growth

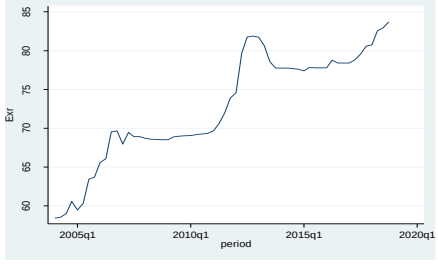


Figure: Time Plots of Exchange Rate

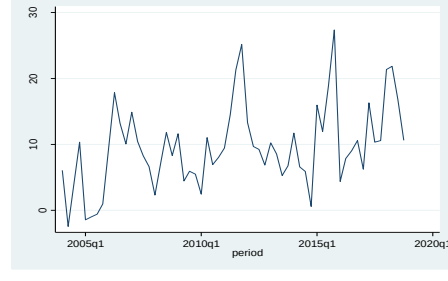


Figure: Time Plots of Real GDP Growth

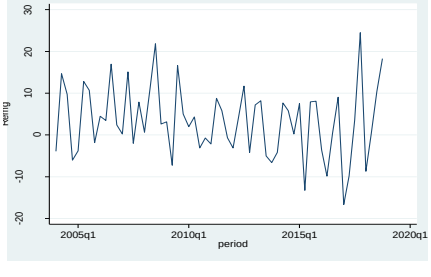


Figure: Time Plots of Worker Remittance Growth

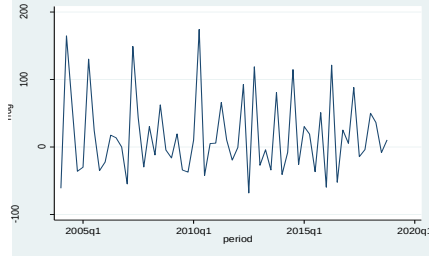


Figure: Time Plots of Trade Balance Growth

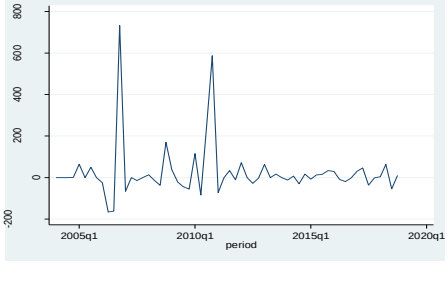


Figure: Time Plots of FDI Inflow Growth

Source: Author's calculation using STATA 14 version.

Appendix 2: Results of Autocorrelation, Heteroskedasticity and Normality Tests

```
. estat dwatson

Durbin-Watson d-statistic( 12,    59) =  2.044728

. estat bgodfrey, lags(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.702	1	0.4022

H0: no serial correlation

```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(58)     =     59.00
         Prob > chi2  =    0.4387

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	59.00	58	0.4387
Skewness	4.23	11	0.9628
Kurtosis	1.07	1	0.3007
Total	64.30	70	0.6696

```
. predict resid, residuals
(1 missing value generated)

. sktest resid
```

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
resid	59	0.2181	0.2720	2.86	0.2399

```
.
```

Developing a Digital Payment Systems in Bangladesh

Dr. Md. Akhtaruzzaman
Dr. Sayera Younus
Sirajul Islam
Md. Abdul Karim[1]

Abstract

Digital payment systems play a crucial role in developing an efficient payment system in both developed and developing countries. Given the benefits of digital payments, Bangladesh Bank has upgraded and digitized its payment and settlement system remarkably over the past few years. The paper discusses on present digital payment system in Bangladesh, its advantages, disadvantages and limitations. Policy Recommendations to digitize domestic payment system are: developing a unique identification program in a centralized database that both public and private sector players can access to verify identities, implementing strict monitoring systems to prevent illegal money transaction, establishing an appropriate consumer protection framework, promoting product understanding and consumer education, improving regulatory environment, implementing interoperability among the platforms, Promoting merchant acceptance infrastructure, leveraging existing networks quickly to far-reaching areas, digitizing all government receipts & payments and merchant payments, and adopting appropriate cyber security measures.

Keywords: payments system, digitalization, regulations, regional cooperation.

JEL Classification: E42, E58, F15.

[1]Authors are Executive Director, General Manager, and Deputy General Managers of Bangladesh Bank, respectively. The views expressed in the paper are the authors, and do not necessarily reflect those of the Bangladesh Bank. Any comment/suggestion/input is welcome at sayera.younus@bb.org.bd

1. Introduction

Payment system plays a crucial role in managing market economy and implementing monetary policy. The healthy growth of financial market is achieved through a safe and efficient payment and settlement system. By delivering the financial services in the rural and remote areas, payment system helps financial inclusions and boosts up economic momentum and development. According to the Section 7A (e) of the Bangladesh Bank Order, 1972; one of the main functions of the Bangladesh Bank (BB) is - "to promote, regulate and ensure a secure and efficient payment system". In fulfilling this mandate, BB has been working to develop efficient payment systems for the stability of the financial system and the efficiency of the monetary policy operations. Over the past few years, BB has upgraded and digitized its payment and settlement system remarkably. Successful adoption of modern technology for both retail and large value payments has revolutionized the whole payment system. Mass people are enjoying more freedom of choice in their payments. The new payment channels have also reduced the cost of doing business in the country.

A report (November 2016) produced by Better Than Cash Alliance revealed that government entities, businesses, and individuals make only 12 percent of payments by value (equating to $44 billion of $367 billion total annual payments), and only 6 percent of payment by volume (around 260 million of 4.4 billion total payments) by electronic means. According to the mentioned report, 31 percent of government transactions, 97 percent of business payments and 97.5 percent of individual payments are being made in cash. This illustrates significant potential for further digitization of all types of payments to help build a digital payments ecosystem in Bangladesh.

In this context, highlighting the major benefits of digital payments this paper describes the state of the present payment system and some stylized facts about digital payment in Bangladesh. The paper also identifies specific challenges to digitize the county's payment system, and offers some specific actions that may be taken to facilitate the spread of digital payments in Bangladesh.

2. Literature Review

The literature on the digital payment systems is not very common. This is relatively new concept developed around the world. Besides, cross boarder digital payments is relatively new topic and very few studies are found on this issue. Currently, there are many regions around the world desire to create close economic spaces owing to the strong interrelation among the neighbouring countries. This opens several opportunities for innovation and

growth within the region. For example, South African Development Community (SADC) Payments Project is a collective initiative of 15 member countries in South African region. Single Euro Payments Area (SEPA) is an initiative undertaken to achieve greater economic and political alliance in the EU (European Union). The GCC-Net (Gulf Cooperation Council's Net) is a single ATM network linking all the GCC National Switches.

Uddin and Akhi (2014) analyzed the electronic wallet "e-wallet" system for Bangladesh. They argued that traditional business models are increasingly coming up against their limits, whereas e-wallet is a convenient, easy-to-use and secure payment system. They identified Authentication (digital signature, finger prints, two steps verification, password or smartcards etc.) as the main issue that should be taken care of for electronic payments system in Bangladesh. Goyal (2015) examined the role payment systems in South Asian integration. The author expressed that as payment systems become more sophisticated and their capabilities converge in the region, they can more actively facilitate trade. Author also opined that the existing Asian Clearing Union can be revitalized using developments in payment systems. Changes include faster settlement using real time flow, reduction in transaction costs and expansion of facilities offered. A study conducted by a2i Program of Prime Minister Office, Bangladesh found that the digitization of G2P payment of the six social safety net programs would save an estimated US$146 million annually which was 44 percent of the total operating cost, or 3 percent of the total budget of the six safety net programs studied.

3. Benefits of Digital Payments

Digital payments have lots of upsides. The major benefits of digital payments systems are:

Increase transparency

Cash payments are subject to leakage. Payments may not be reached to recipient in full or may be reached to fake recipients particularly in case of government transfer payments. Cash-based transactions are often prone to errors, such as double-billing or charging late fees when bills have actually been paid on time. In contrast, the traceability of the payment is improved with digital payments. First, recipients have digital records of the payments. Second, it generally requires more stringent identification documentation.

Lower costs

Recipients of cash payments often have to travel bank branch or government office to receive a remittance or government transfer or make a bill payment. This results in

significant travel time and expenses. This is further costly in terms of income forgone while traveling and waiting to collect a payment. Digital payments can be made quickly and efficiently which decrease overall costs.

Increase risk management

Digital payments can strengthen informal insurance networks. Digital network help people to tackle shocks by collecting money from friends and relatives in worse time. Digital payments allow governments and NGOs to reach the affected people rapidly and effectively.

Improve speed and timely delivery

In contrast to a cash payment, digital payments can be virtually instantaneous, regardless of whether the sender and receiver are in the same town, district or country. This means that employees are paid on time. In emergency situations speedy and timely delivery is important.

Increase security

Recipients of cash payments are often vulnerable to street crime. Digital payments can be held more securely than cash payments. Recipients can store value in his/her accounts or e-wallets, and cash out smaller amounts at their convenience or directly transfer funds onwards to pay for bills.

Increase financial inclusion

Digital payments are an important tool for financial inclusion as they provide financial services to poor at lower cost. Digital payments are often the first entry point into the financial system for individuals. Financial institutions see their cost of services is high and products are not suitable for unbanked people. Digital payment is well suited to address these unbanked people.

Increases women's economic participation and empowerment

Digital payments can contribute to increase women's economic participation and empowerment. Digital payment is often allows the recipient to conceal the payment from other household members or friends who may place demands on the use of the money.

Increase credit information and fewer non performing loans

The inclusion of digital payments data in consumer credit files can be used for credit assessment. This information allows lenders to distinguish between bad borrowers and good borrowers.

Improve Agricultural productivity and ensure food security

Digital payments can help farmers to improve agricultural productivity and ensure food security. Digital payment connects farmers more closely to their buyers and suppliers. It can help farmers to sell their crops quickly with higher prices. It also allows farmers to access needed credit, agricultural inputs and subsidies provided by the government.

4. Payment Systems of other SAARC Countries

The Board for Regulation and Supervision of Payment and Settlement Systems (BPSS), a sub-committee of the Central Board of the Reserve Bank of India (RBI) is the highest policy making body on payment systems in the country. The State Bank of Pakistan (SBP) has been playing a key role as a regulator, operator and facilitator of National Payment Systems. The large value payment system in Pakistan facilitates clearing and settlement of interbank payments, government, and corporate securities and other critical financial transactions. On the other hand, retail payment system has become crucial for the provision of digital financial services to the general public. The Royal Monetary Authority of Bhutan (RMAB) implemented Cheque Truncation System in 2007 and Electronic Funds Transfer and Clearing System (EFTCS), which consisting of three electronic payment system i.e. National Electronic Clearing System Credit (NECS Credit), NECS Debit and National Electronic Funds Transfer (NEFT), in 2010. While NECS enables interbank single debit and multiple credit/ multiple debit and single credit transfers, NEFT facilities one to one interbank funds transfer among its member banks. Bhutan implemented Bhutan Financial Switch (BFS) in 2011 to enable interoperability of ATMs and POS. Bhutan Immediate Payment Service (BIPS) was launched in 2017 which captured major chunk of retail payments. Currently, process is ongoing for inter-connection between BFS and National Financial Switch (NFS) of India to enable cross-border interoperability of RuPay cards issued by commercial banks in the ATM's and PoS terminals in India and Bhutan. Payment systems of Sri Lanka mainly fall into two categories – Large Value Payment Systems (LVPS) and Retail Payment Systems and Instruments (RPSI). The RTGS System is the payment system which falls into the category of LVPS. The RPSI on the other hand are many and varied. These systems can be further classified as paper based systems and electronic fund transfer systems. Cheques are the most widely known and freely used retail payment instrument among the general populace. However, payment cards, mainly comprising of debit and

credit cards, are gaining ground fast as a speedier method of making retail payments. The Sri Lanka Inter-bank Payment System (SLIPS) is an online interbank electronic fund transfer system catering mainly for low-value payments (up to Rs 5 million). Mobile banking and internet banking are relatively recent phenomena. The Common Card and Payment Switch (CCAPS), consists of five sub-switches, was established in 2003 under the brand name "LankaPay" with the objective of creating a single platform for electronic retail payments in Sri Lanka.

The existing retail payment systems of Nepal are Nepal Clearing House Ltd. (NCHL), Smart Choice Technologies (SCT), Nepal Electronic Payment System (NEPS) and Interbank Payment System (IPS). NCHL is electronic cheque clearing system which supports cheque clearing system. SCT and NEPS are shared ATM Networks which facilitates the processing of card transactions. IPS is operated by NCHL which facilitates interbank payments, direct debit and credit credits. The larger value payments are still processed manually through cheques. The threshold for large value payments for cheque clearing currently stands at Rs 100 million. While NCHL clears cheque denominating between Rs 100 million and Rs 300 million through Electronic Cheque Clearing (ECC) system, Nepal Rastra Bank (NRB) clears cheque denominating more than Rs 300 million manually. NRB is also in a process to establish RTGS for critical and large value payment processing in order to enhance effectiveness and smoothness in payment systems. In Maldives, currently all inter-bank transactions are executing via the Maldives Real Time Gross Settlement (MRTGS) system and the Automated Clearing House (ACH) system, which are both operated by the Maldives Monetary Authority (MMA). The MRTGS system processes and settles urgent, high value inter-bank transactions. Meanwhile, the ACH system is a session based clearing system for low value batch transactions consisting of three components, namely, direct credits, direct debits and cheque imaging and truncation. Payments through card and mobile banking have become increasingly popular and dominant electronic means of payment in the Maldives

5. State of the Payment System and Some Stylized Facts about the Digital Payments in Bangladesh

BB has undertaken various efforts on development of the country's payment systems since 2006. Bangladesh Automated Cheque Processing System (BACPS) started its live

operation since 2010. Later on, Electronic Funds Transfer (EFT), National Payment Switch Bangladesh (NPSB), e-Commerce, Mobile Financial Services (MFS), m-Commerce and Real Time Gross Settlement (RTGS) system joined the BACPS. These payment platforms are briefly described in the following sections.

Bangladesh Automated Clearing House (BACH)

BACH has two components - the Automated Cheque Processing System and the Electronic Funds Transfer. Both the systems operate in batch processing mode. Transaction instruments or instructions received from the banks during the day are processed at a pre-fixed time and settled through a single multilateral netting figure on each individual bank's respective book maintained with the BB.

Bangladesh Automated Cheque Processing System (BACPS)

BACPS uses CIT (Cheque Imaging and Truncation) technology for clearing the paper-based instruments, i.e. cheque, pay order, dividend & refund warrants, etc electronically. There are two clearing sessions available under BACPS, cheque valued Taka 5,00,000 (five lac) or above are eligible to be cleared in High Value (HV), while cheques of any amount may be cleared at a Regular Value (RV) clearing session. The clearing cycle has been brought down to t+1 for regular value cheques and t+0 for high value cheques throughout the country.

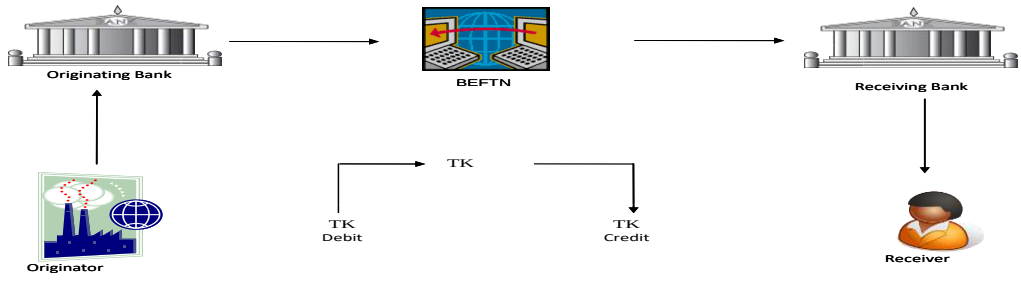
Bangladesh Electronic Funds Transfer Network (BEFTN)

BEFTN facilitates interbank payment, clearing and settlement of electronic credits as well as debits. BEFTN started its 'Live Operation with credit transactions in 2011 with a view to encouraging paper-less electronic payment methods. The network started its operations with debit transactions from September 15, 2011.

EFT Credit Transaction:

In EFT credits, the Originator instructs his/her bank to debit his/her account and transfer the fund to a Receiver's account. Payroll, dividends, refund payments, Business to Business payments and Government Benefit payments are some examples of EFT Credit transactions.

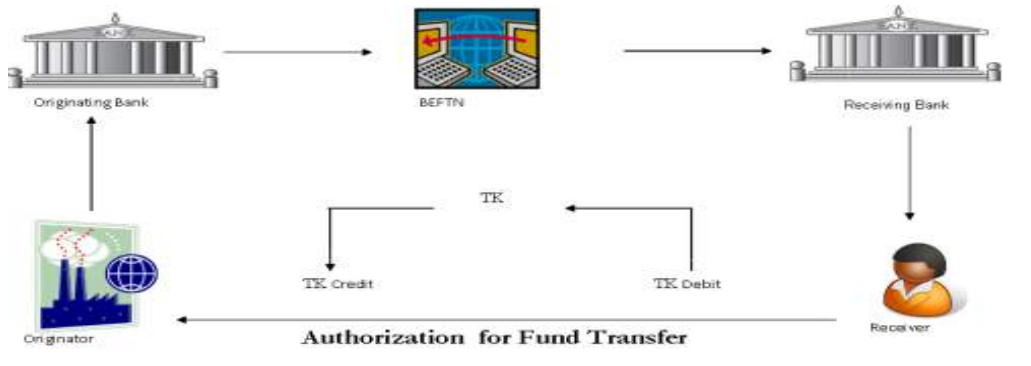
Transaction and Fund Flow of EFT Credit:



EFT Debit Transaction:

In EFT debits, the Originator instructs his/her bank to collect payment from a receiver often on a recurring basis. Utility bills, loan installments, insurance premiums are the example of EFT debit transactions.

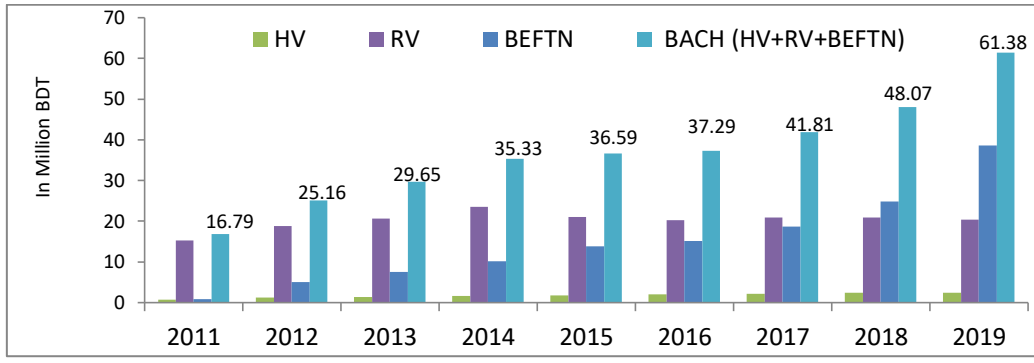
Transaction and Fund Flow of EFT Debit:



Transaction Status through BACH

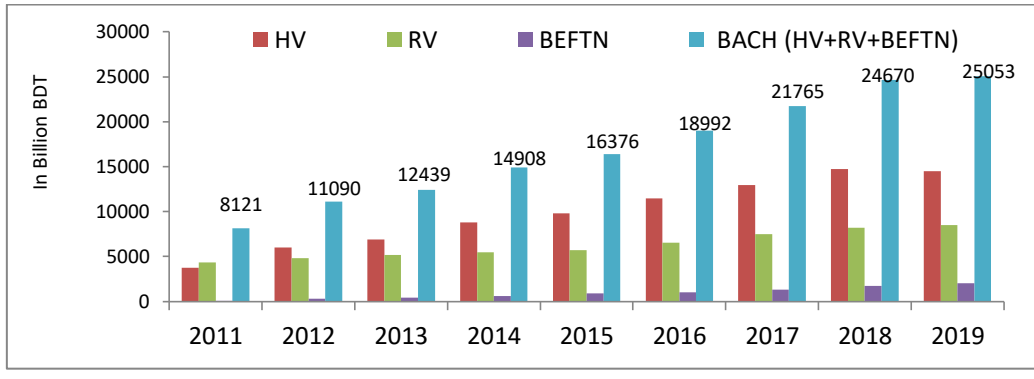
Transaction profile through BACH showed a steady growth over the years. In 2019, total 61.38 million items amounting to Taka 25053 billion were transected under BACH. Of which, 20.36 million regular cheques, 2.40 million high value cheques and 38.61 million EFT cheques valued at Taka 8520 billion, Taka 14480 billion and Taka 2052 billion respectively. The average monthly transaction through BACH also increased over the years. In 2019, on average monthly around 5.11million instruments were processed through BACH which valued at Taka 2088 billion (Annexure 1, Table-1, and Figure: 1 (a) and 1(b)).

Figure 1 (a): Number of Transaction Processed in BACH



Notes: HV=High Value, RV=Regular Value, BEFTN= Bangladesh Electronic Funds Transfer Network, BACH= Bangladesh Automated Clearing House.

Figure 1 (b): Amount of Transaction in BACH



Notes: HV=High Value, RV=Regular Value, BEFTN= Bangladesh Electronic Funds Transfer Network, BACH= Bangladesh Automated Clearing House.

Mobile Financial Services (MFS)

With the ability to deposit or withdraw and send or receive funds to mobile account, MFS system has become an important part of the financial system in Bangladesh. Banking service in Bangladesh is traditionally branch-based concentrated mainly in the urban areas. As of December 2019, there are about 10578 bank branches of 59 banks. Core banking solution i.e. online banking is not available in all branches of all commercial banks. Thus customers need to come to bank-branches due to limitation of online as well inadequate alternative delivery channels of banking services. As of December 2019, there are 20181877 Card, 10924 ATM and 58527 POS terminal throughout the country with

significant concentration in urban areas. Vast majority of the population live in the rural area and outside the coverage of traditional banking services. Number of bank account is 106.6 million (December 2019) in the country whereas the number of mobile user is 165.6 million (December 2019). Since mobile users have a better geographical distribution, mobile financial service is thus a critical aspect of the country's financial inclusion.

Rapid countrywide expansion of mobile phone networks and modernization of the country's payment systems and IT infrastructure have opened up opportunities for mobile phone based off-branch financial services delivery to the underserved population. MFS becomes a key driver of financial inclusion in transferring money from urban to rural, from privileged to under privileged to fuel the rural economy and in unblocking the advancement opportunities for the un-served and the underserved.

The permitted Mobile Financial Services in broad categories are as follows:

- Disbursement of Inward foreign remittances (Only the domestic part of transaction, no cross border transaction is permitted);
- Cash-in and cash-out using mobile account through agents, bank branches, ATMs and Mobile operator's outlets;
- Person to business payments. e.g. utility bill payments, merchant payments;
- Business to person payments. e.g. salary disbursement, dividend and refund warrant payments, vendor payments etc;
- Government to person payments. e.g. elderly allowances, subsidies etc;
- Person to Government Payments e.g. Tax, Levy payments;
- Person to Person Payments (One registered mobile account to another registered mobile account);Other Payments like microfinance, overdrawn facility, insurance premium, DPS, etc.

Till to date, a total of 28 banks and 1 subsidiary have been awarded with MFS licenses, although only 16 banks and one subsidiary are currently offering MFS. Transaction vis MFS expanded enormously over the years. During 2014-2019, transaction of MFS was higher by 4.7 times in terms of volume and 4.2 times higher in terms of value. The number of agents, registered customers and active account were also increased significantly during the period. At the end of December 2019, the total number of

registered MFS customers stood at 79.51 million, being served by almost 971620 agents nationwide. In 2019, the number of transactions via MFS was 2589.81 million valued at Taka 4344.90 billion (Annexure: Table 2, and Figure: 2, 3 and 4). Bkash and ROCKET are the two most prominent players in MFS industry in Bangladesh. The present market share of different services through MFS shows that the highest transactions are cash in transactions of 36 percent followed by cash out 33 percent, P2P 24 percent, B2P 2 percent, merchant payment 2 percent and utility bill payment (P2B) 1 percent.

Figure 2: No. of Agents, Customers and Active Accounts in MFS in Bangladesh

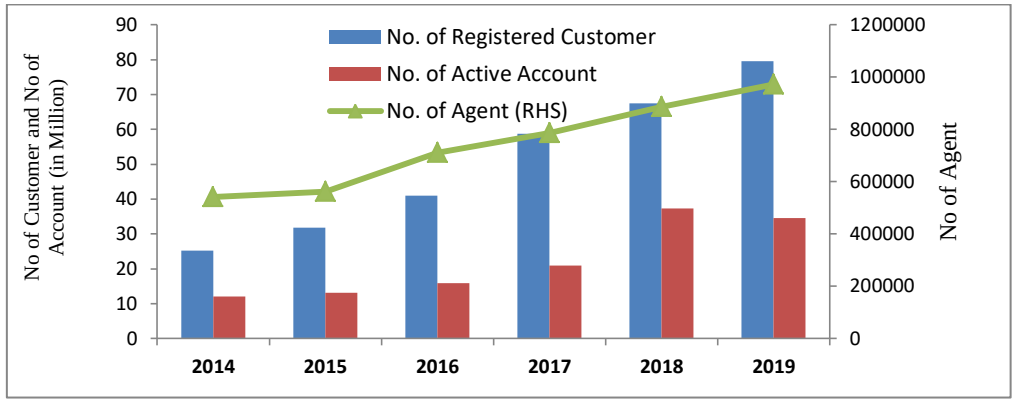


Figure 3: Trends of MFS Transaction in Bangladesh

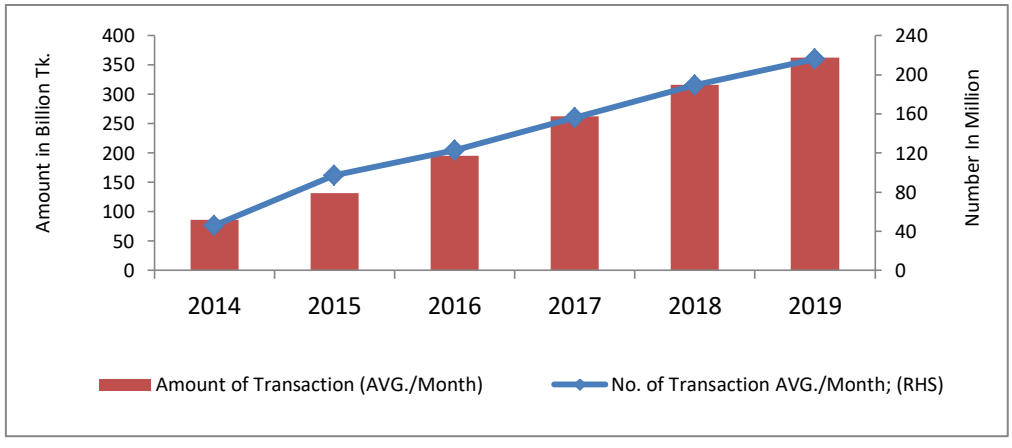
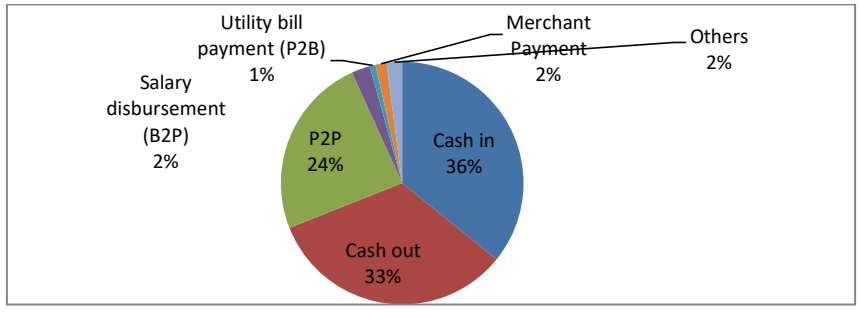


Figure 4 : Market Shares of Different Services in MFS (in December 2019)



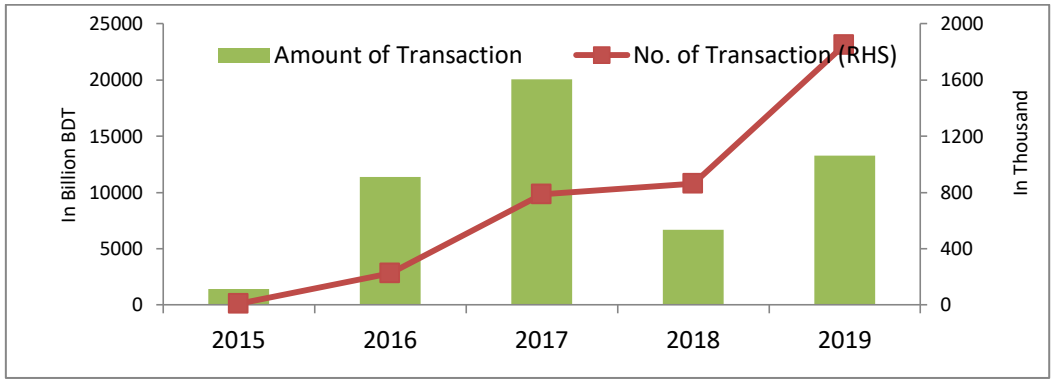
Currently, an individual may deposit maximum amount of Taka 30,000 in MFS account each day and Taka 2 lakh monthly. The transaction ceiling of person to person under MFS in Bangladesh is as follows:

	Frequency	Maximum Number	Ceiling (in Taka)
Cash in	Daily	5	30,000
	Monthly	25	2,00,000
Cash out	Daily	5	25,000
	Monthly	20	1,25,000
P2P	Daily	–	25,000
	Monthly	–	75,000

Bangladesh Real Time Gross Settlement (BD-RTGS) System

BD-RTGS is an electronic inter-bank payment settlement system where transfer of funds takes place from one bank to another on 'real time' and on 'gros' basis. Settlement in `real time" means transaction is not subjected to any waiting period. `Gross settlement" means the transaction is booked in central bank's account on one to one basis without netting with any other transaction.

Figure 5: Trends of RTGS Transactions in Bangladesh



It is worthwhile to mention that more than 7000 online branches of scheduled banks are connected (As of June 2018) to this system out of existing 11000 bank branches in the country. The system is allowed to handle only high value (Taka 1 lac and above) local currency transactions and domestic foreign currency transactions are expected to be executed soon. The transactions with RTGS showed overwhelming growth since inception. The number of items processed through RTGS rose from just only 8.83 thousand in 2015 to 1848.48 thousand in 2019. Similarly, the amount transaction through RTGS during the period was also roughly 10 times higher which rose from Taka 1387 billion in 2015 to Taka 13261 billion in 2019 (Annexure 1: Table-3, and Figure 5).

National Payment Switch of Bangladesh (NPSB)

In order to facilitate interbank electronic payments originating from different channels like ATM, POS and internet, etc., BB introduced NPSB in 2012. The main objective of NPSB is to act as a mother switch and to connect all child switches (owned and operated either by bank or a non bank entity) ultimately to create a common platform for the switches which settle the electronic payment in Bangladesh. As of January 2020, 53 banks are operating card based electronic payment process in Bangladesh. Among those, interbank ATM transactions of 52 banks, POS transactions of 51 banks and IBFT (Internet Banking Fund Transfer) transaction of 24 banks are being routed through NPSB. Other banks are also likely to join NPSB soon.

NPSB is contributing to popularize card-based electronic payment in Bangladesh. As a result, cards and various card-based payment terminals are growing very fast (Annexure 1, Table-4). The transactions of interbank ATM, POS and IBFT through NPSB are also

growing rapidly. In 2019, NPSB has processed 30696 thousand transactions amounting to Taka 211251 million. It is observed that, during the period 2015-2019, the transaction values of ATM and POS were 4.3 and 75.0 times higher respectively. During the same period, NPSB transaction was 4.2 times higher in terms volume and 5.1 times higher in terms value (Annexure: Table 5, and Figure 6 (a)-6(e).

Figure 6 (a): Trend of ATM Transaction

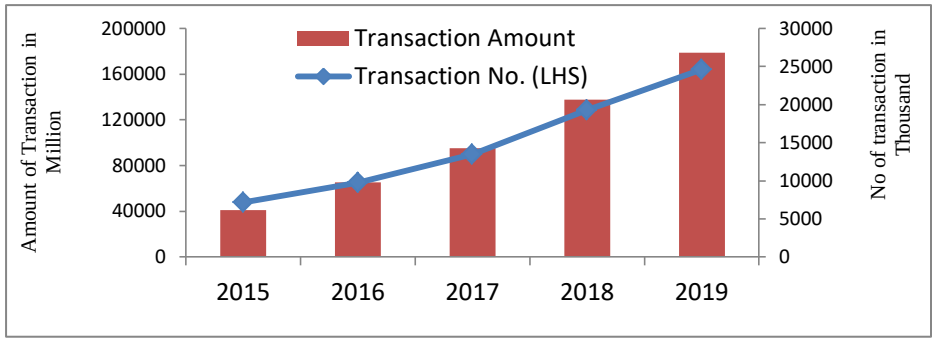


Figure 6 (b): Trends of POS Transaction

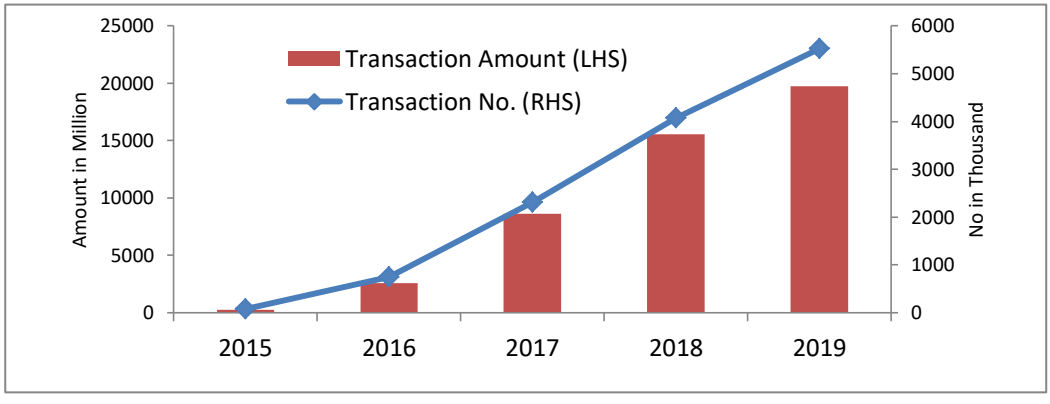


Figure 6 (c): Trend of IBFT Transaction

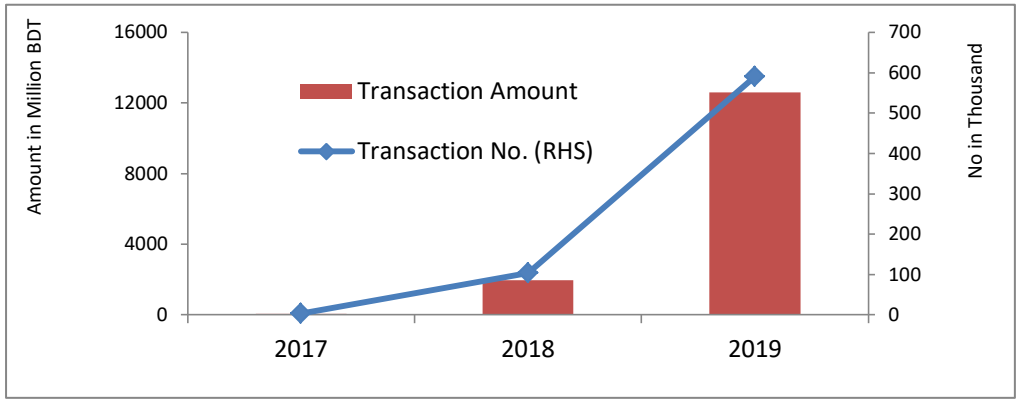


Figure 6 (d): Trend of Transaction in NPSB

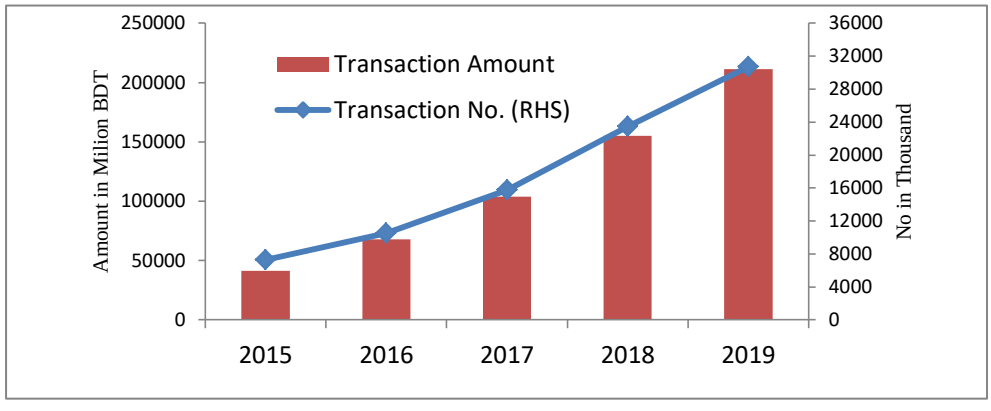
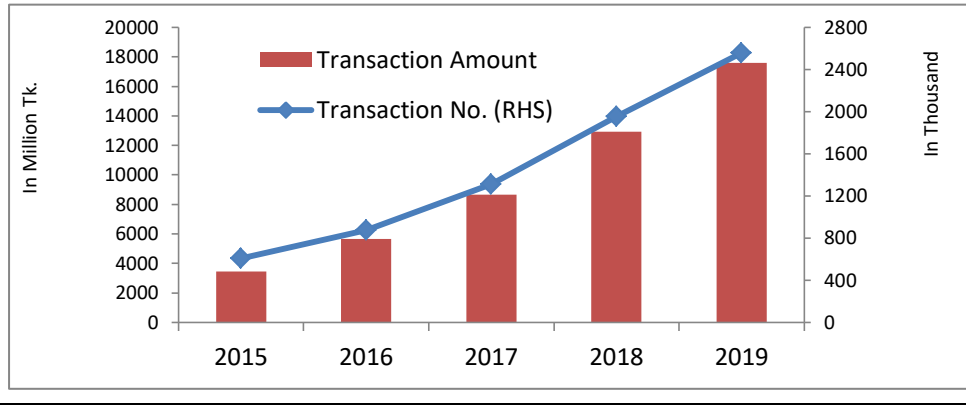


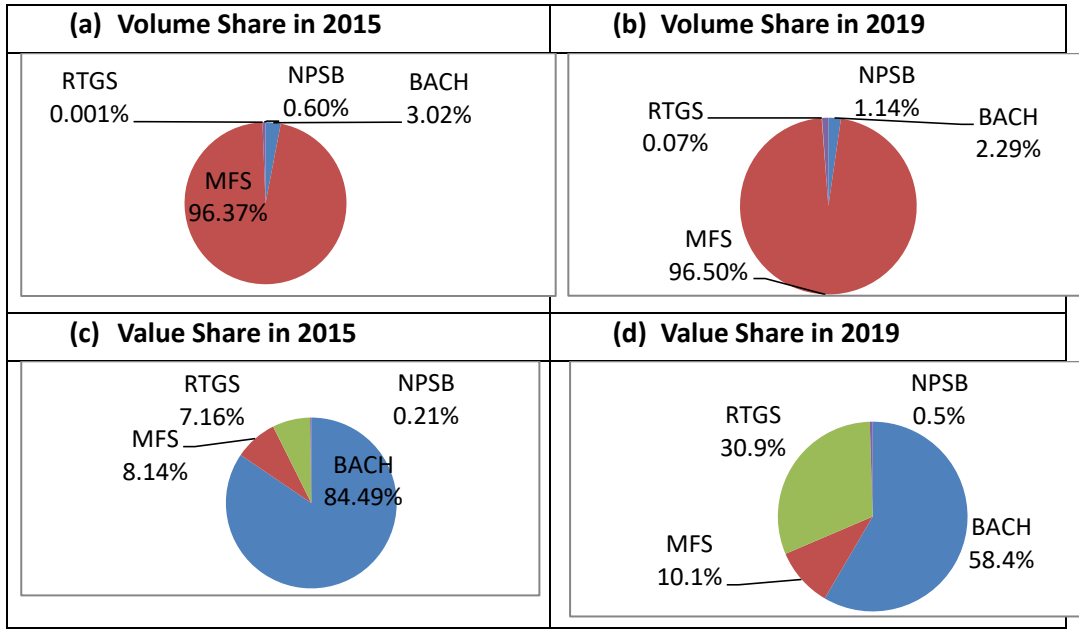
Figure 6 (e): Average Monthly Transaction of NPSB



Relative importance of the Payment Platforms of Bangladesh

Figure 7 and Annexure 1, Table-6 show the relative market share of various payment platforms over time. It is observed that the dynamics of shares of the most of the payment services, except BACH, showed rising trends over the years. In terms of number of transactions, the share of MFS far outweighed other payment services, which was 96.5 percent in 2019. In terms of value, BACH contributed the largest share of 58.4 percent transaction, followed by RTGS 31 percent transaction, and the share of MFS was roughly 10 percent in 2019. It is also mentionable that different payment platforms are facilitating different types of payment needs of the customers. RTGS meets the need of large value payment while BACH serves for both large and small payments. The NPSB and MFS mainly deal with small ticket size retail payments. Therefore, though MFS cleared 96 percent of transaction, its value share was relatively less due to its smaller ticket size nature of transaction.

Figure 7: Comparison of Market Share of Payment Platforms



Payment Systems Operator (PSO) and Online Payment Gateway Service Providers (OPGSPs)

As a growing economy, e-commerce and online purchases are gradually getting popular and increasing in the country. OPGSPs play a crucial role for settling the payment leg of e-commerce and online purchases. Considering the market demand, BB has permitted 05 (five) organizations to work as PSO to facilitate the payment leg of the e-commerce and online purchases. Banks are now allowed to offer the facility of receiving remittances against small value service exports in non-physical form such as data entry/data process, off-shore IT service, business process outsourcing etc. The exporters of the above services will be able to receive their overseas payments through the OPGSPs.

E-Commerce and M-Commerce facilitation

BB has issued directives to the banks for starting e-Commerce activities among the country. BB has permitted transfer fund up to TK. 5,00,000 from one clients account to another clients account lying in the same bank using internet/online facilities subject to the fact that it will fully comply with prevailing money laundering prevention legislations. In order to ensure IT security for online and e-commerce transactions BB has mandated for the banks to introduce 2FA (Two Factor Authentication) for card not present transactions valuing Tk 5000 and above. In order to start M-Commerce in Bangladesh, mobile network operators have been given permission to sell railway tickets and tickets of cricket matches organized by the BCB (Bangladesh Cricket Board) using mobile technology. Three Telcos have got permission for m-Commerce related transactions.

Legal & Regulatory Frameworks

BB published a number of legal and regulatory documents to provide legal and regulatory support for electronic transfer of funds:

- "Bangladesh Automated Cheque Processing Systems (BACPS) Operating Rules and Procedures" in January 2010.
- "Guidelines on Mobile Financial Services for the Banks" in September 2011.
- "Guidelines on Agent Banking for the Banks" in December 2013.
- "Bangladesh Payment and Settlement Systems Regulations (BPSSR), 2014" in May 2014.
- "Bangladesh Electronic Funds Transfer Network (BEFTN) Operating Rules" in May 2014.
- Bangladesh Mobile Financial Services (MFS) Regulations, 2018

Other Payment Systems Initiatives

- BB has finalized the draft Payment and Settlement Systems Act 2017 which is now under process for approval.
- Steps have also been taken to bring amendment in certain provision of Negotiable Instruments Act, 1881 and Bankers Book of Evidence Act, 1891.
- BB is working closely with the government organizations for introducing online VAT payment system.
- BB has arranged several seminar, rally and road-show at different divisional cities as a part of awareness raising campaign.

6. The Bottlenecks/Challenges of Digital Payment System in Bangladesh

There are so many positive developments happened in last couple of years to upgrade and digitize the national payment system of Bangladesh. However, there are also some bottlenecks and challenges that need to be fine tuned and resolved to develop the payment system further. The major challenges are:

Safety and reliability

Maintaining confidence and reliability is a major challenge for digital payment. Digital payments could have adverse effects if it does not work properly. Payment delays or agents' liquidity problem can undermine entire program. People may fail to trust on the new system. Digital payment mechanisms must have security breaches, proper dispute resolution mechanism and fraud management policies.

Probable cyber crime

Cyber security has remained a matter of concern for many banks. Some banks are still lag behind in using two-factor authentication to protect consumers' accounts. Usage of biometric security technology is still limited in Bangladesh. Lack of qualified IT manpower and lack of knowledge among clients about cyber crime also pose risks to digital payment system.

Interoperability of bank and nonbank financial service providers

Lack of interoperability among MFS, banks, and other platforms is a significant barrier to developing a digital payment system. Moreover, monopoly situation in MFS market, where market leader (Bkash) captures about 90 percent of market share, is also a big challenge. It may be mentioned that there are only 38077 POS and 9586 ATMs, and in

total only 47663 acceptance points in the country, whereas mobile banking has more than 811073 acceptance points. Therefore, convergence of MFS and card system may be considered so that mobile and card can complement each other.

Physical infrastructure

Providing access to financial services or cash-in/out points and ensuring sufficient liquidity at access points remain the core challenges in moving toward digital payments. The lack of electricity, towers, mobile network, and poor roads and transport networks are bottlenecks for digital payment services in rural areas. Leveraging new technologies such as mobile phones, ATMs, POS terminals and online services, and modernizing existing infrastructure can be an effective way to reach rural people.

Consumer education

Educating people about the digital payment service is a challenge. Many recipients may not understand cash-out process or how to use an ATM. These people might not be comfortable with using a digital payment system. Recipients must be educated about using and remembering their PINs (personal identification numbers), have to understand how much money they receive, not to share their PIN and what to do if something went wrong.

Money Laundering and Financing of Terrorism Issue

Preventing suspicious transaction, ML (money laundering) and TF (terrorist financing) via digital payments is a major challenge. OTC (Over-the-Counter) transaction remains a dominant part of MFS in Bangladesh. As OTC customers do not have KYC (Know Your Customer) information, they may facilitate untraceable transfer of illicit money. Preventing use of MFS Channels to settle Hundi is also a challenge for Bangladesh.

Policy Recommendations to Digitize Domestic Payment System

The following measures may effective to expedite our journey from cash to digital payments:

- Developing a unique identification program in a centralized database that both public and private sector players can access to verify identities,
- Implementing strict monitoring systems to prevent illegal money transaction,
- *Establishing an appropriate consumer protection framework,*
- *Promoting product understanding and consumer education,*

- Improving regulatory environment **,**
- Implementing interoperability among the platforms,
- Promoting merchant acceptance infrastructure,
- Leveraging existing networks quickly to far-reaching areas,
- Digitizing all government receipts & payments and merchant payments, and
- Adopting appropriate cyber security measures.

7. Conclusion

Transparency, speed, and costs are the primary motivation for end-users of a payment system. These goals are not easy to achieve. For improvements, we need to develop a payment platform that offers high quality payment services not only domestically but also across the borders. However, working with a diversified group requires a careful balance between innovation, new technology, and expectations of the end users.

Establishing a efficient electronic payment platform in the country we need to promote fast, safe, and efficient means of payments system. A common digital platform would enhance the efficiency of cross-border payments by increasing the speed and reducing the cost of transactions. However, before Bangladesh joins such a platform, it is essential to further modernize the domestic payment infrastructures and interoperability, harmonizing the rules and regulations, and standardizing technical processes across the cross boarder nations.

References

Bangladesh Bank. (1972). Bangladesh Bank Order, 1972. Dhaka.

Bangladesh Bank. (2018). Annual Report 2017–2018. Dhaka

Bank for International Settlements. (2005). General Guidance for Payment System Development. Consultative Report, Committee on Payment and Settlement Systems.

Bank for International Settlements and World Bank. (2007). General Principles for International Remittance Services. Committee on Payment and Settlement Systems.

Better than Cash Alliance. (2016). Building Digital Bangladesh: The Way Forward for Digitizing Payments, Country Diagnostic. Retrieved from http://www.pistrategy.org/wpcontent/uploads/2016/12/Bangladesh-DiagnosticExecutiveSummary.pdf

Country Papers of SAARC Countries. (June 2018). Developing a Common Platform for Strengthening Digital Payment System in the SAARC Region. Papers presented at SAARC FINANCE Governors Symposium, Kathmandu, Nepal.

Goyal, A. (2015). Payment systems to facilitate South Asian integration. Indira Gandhi Institute of Development Research, Mumbai. http://www.igidr.ac.in/pdf/publication/WP-2015021.pdf

Heinrich, G., and Dubon, E. G. (2011). The development of a regional payment system in Central America: A step towards further integration and economic development. MPRA Paper No. 47398.

Uddin, M. S., and Akhi A. Y. (2014). E-wallet system for Bangladesh - an electronic payment system. International Journal of Modelling and Optimization, 4(3), 216-219

World Bank. (2014). The opportunities of digitizing payments. World Bank Development Research Group, Better Than Cash Alliance, and Bill & Melinda Gates Foundation. http://documents.worldbank.org/curated/en/188451 468336589650/pdf.

Annexure 1

Table 1 (a) : Transaction Status in BACH

1. (a) Item Processed in BACH

(No. in Million)

Year	BACPS		BEFTN	BACH (HV+RV+BEFTN)	Ave./ Month
	HV	RV			
2011	0.68	15.30	0.82	16.79	1.40
2012	1.26	18.82	5.07	25.16	2.10
2013	1.37	20.69	7.59	29.65	2.47
2014	1.61	23.50	10.21	35.33	2.94
2015	1.81	21.02	13.76	36.59	3.05
2016	1.99	20.22	15.09	37.29	3.11
2017	2.22	20.95	18.64	41.81	3.48
2018	2.41	20.85	24.80	48.07	4.01
2019	2.40	20.36	38.61	61.38	5.11

1 (b) : Transaction Amount in BACH

(Amount in Billion Taka)

Year	**BACPS**		**BEFTN**	**BACH** (HV+RV+BEFTN)	**Average/Month**
	HV	**RV**			
2011	3732	4335	54	8121	677
2012	5977	4827	285	11090	924
2013	6877	5165	396	12439	1037
2014	8812	5497	598	14908	1242
2015	9795	5707	874	16376	1365
2016	11479	6518	994	18992	1583
2017	12969	7462	1334	21765	1814
2018	14733	8214	1723	24670	2056
2019	14480	8520	2052	25053	2088

Source: Bangladesh Bank.

Notes: HV=High Value, RV=Regular Value, BEFTN= Bangladesh Electronic Funds Transfer Network, BACH= Bangladesh Automated Clearing House.

Table 2 (a) : Present Scenario of MFS in Bangladesh

2 (a) Number of Agents, Customers and Accounts

YEAR	No. of Agent	No. of Registered Customer (in Millions)	No. of Active Account (in Millions)
2014	540984	25.19	12.15
2015	561189	31.85	13.22
2016	710026	41.08	15.87
2017	786460	58.79	21.00
2018	886473	67.52	37.30
2019	971620	79.51	34.65

2 (b) : Transaction of MFS

	No. of Transaction	**No. of Transaction (AVG./Month)**	**Amount of Transaction**	**Amount of Transaction (AVG./Month)**
	in Million	in Million	in Billion Taka	in Billion Taka
2014	549.48	45.79	1031.55	85.96
2015	1166.05	97.17	1577.73	131.48
2016	1473.24	122.77	2346.92	195.58
2017	1875.63	156.30	3146.62	262.22
2018	2272.75	189.40	3788.86	315.74
2019	2589.81	215.82	4344.90	362.07

Source: Bangladesh Bank.

Table 3 : Yearly Transaction through RTGS

Year	**No. of Transaction** (In thousands)	**Amount of Transaction** (In Billion Taka)
2015	8.83	1387.1
2016	225.82	11378.28
2017	785.29	20063.90
2018	863.35	6674.75
2019	1848.48	13260.95

Source: Bangladesh Bank.

Table 4: Total Number of Card, ATM and POS in Bangladesh				
Terminal	June 2017	June 2018	June 2019	December 2019
No. of Debit Card	10802217	12575605	15758977	18231093
No. of Credit Card	936148	1000474	1203427	1537202
No. of prepaid Card	205285	158526	277498	413582
Total Cards	11943650	13734605	17239902	20181877
ATM Booth	9246	9747	10722	10924
POS	36288	41130	52846	58527

Table 5 : Transaction through NPSB								
Year	ATM		POS		IBFT		NPSB (ATM+POS+IBFT)	
	No. in thousand	Amount in Million Taka	No. in thousand	Amount in Million Taka	No. In thousand	Amount In Million Taka	No. in thousand	Amount in Million Taka
2015	7197	41162	77	263	-	-	7274	41425
2016	9740	65418	742	2567	-	-	10482	67985
2017	13443	95335	2315	8622	3	42	15760	103999
2018	19261	137650	4077	15572	104	1953	23442	155174
2019	24578	178915	5527	19746	590	12590	30696	211251
Source: Bangladesh Bank.								

Table 6: Dynamics of Market Share of Payment Platforms				
a) Share (%) in Terms of Number of Transaction (Volume)				
Year	**BACH**	**MFS**	**RTGS**	**NPSB**
2015	3.0	96.4	0.0	0.6
2016	2.5	96.8	0.0	0.7
2017	2.2	97.0	0.0	0.8
2018	2.0	96.9	0.0	1.0
2019	2.3	96.5	0.1	1.1
b) Share (%) in Terms of Transaction Value				
Year	**BACH**	**MFS**	**RTGS**	**NPSB**
2015	84.5	8.1	7.2	0.2
2016	57.9	7.2	34.7	0.2
2017	48.3	7.0	44.5	0.2
2018	69.9	10.7	18.9	0.4
2019	58.4	10.1	30.9	0.5
Source: Bangladesh Bank.				

Annexure 2

Acronyms

ACH	Automated Clearing House
a2i	Access to Information
AML	Anti-Money Laundering
ATM	Automated Teller Machine
BACH	Bangladesh Automated Clearing House
BB	Bangladesh Bank
BACPS	Bangladesh Automated Cheque Processing System
BEFTN	Bangladesh Electronic Funds Transfer Network
BFS	Bhutan Financial Switch
BIPS	Bhutan Immediate Payment Service
B2P	Business to Person
CCAPS	Common Card and Payment Switch
CFT	*Combating the Financing of Terrorism*
CIT	Cheque Imaging and Truncation
ECC	Electronic Cheque Clearing
EFT	Electronic Funds Transfer
EFTCS	Electronic Funds Transfer and Clearing System
EU	European Union
GCC	Gulf Cooperation Council
G2P	Government to Person
HV	High Value
IBFT	Internet Banking Fund Transfer
IPS	Interbank Payment System
KYC	Know Your Customer
LVPS	Large Value Payment Systems
MFS	Mobile Financial Services
MMA	Maldives Monetary Authority
MRTGS	Maldives Real Time Gross Settlement
NCHL	Nepal Clearing House Ltd.
NECS	National Electronic Clearing System
NEFT	National Electronic Funds Transfer
NEPS	Nepal Electronic Payment System
NFS	National Financial Switch
NPSB	National Payment Switch Bangladesh
NRB	Nepal Rastra Bank
OPGSPs	Online Payment Gateway Service Providers
OTC	Over-the-Counter
P2B	Person to Business
P2G	Person to Government
P2P	Person to Person
POS	*Point of Sale*
PSO	Payment Systems Operator
PSPs	Payment Service Providers
RBI	Reserve Bank of India

RMAB	Royal Monetary Authority of Bhutan
RPSI	Retail Payment Systems and Instruments
RTGS	Real Time Gross Settlement
RV	Regular Value
SAARC	South Asian Association for Regional Cooperation
SADC	South African Development Community
SBP	State Bank of Pakistan
SCT	Smart Choice Technologies
SEPA	Single Euro Payments Area
SLIPS	Sri Lanka Inter-bank Payment System

Call for Research Papers

BBTA Journal

Thoughts on Banking and Finance

Thoughts on Banking and Finance is a half-yearly peer reviewed journal of Bangladesh Bank Training Academy devoted to the examination and critical analysis of economic, banking and financial issues. The journal publishes original empirical, methodological, policy and theoretical papers, contemporary and historical case studies, conference reports, and book reviews that address the topical issues of the relevant areas. The journal seeks to serve a broad range of economists, banking and finance professional in academia and industries. While the journal welcomes divergent views on economic, banking and financial topics, the journal also publishes views from research scholars on other disciplines such as law, management studies, public policy, ethics, information science, environmental and societal challenges concerning sustainable development and sustainable future.

Submission of Manuscripts

Submissions of Manuscripts are invited on significant, original, and previously unpublished research on all aspects of economic, banking and financial issues from both within Bangladesh and overseas. BBTA will not accept any paper which, at the time of submission, is under review for or has already been published, or accepted for publication in a journal or to be presented at a seminar or conference. Papers will be subject to blind peer review. Selection criteria include accuracy and originality of ideas, clarity and significance of results and quality of presentation. Papers will be judged based on the usual measures of quality with consideration of the relevance to the theme. For complete instructions for authors, please see the following guidelines.

Authors should submit manuscripts of papers, 'Book Reviews' or 'Case Studies' to the following postal and e-mail address : Executive Editor, Thoughts on Banking and Finance, & General Manager, Research and Publications Wing, Bangladesh Bank Training Academy, Mirpur-2, Dhaka-1216, Bangladesh. E-mail: bbta.respub@bb.org.bd

Guidelines for the Paper Contributors

BBTA Journal Thoughts on Banking and Finance is published twice in a year by Bangladesh Bank Training Academy (BBTA), Mirpur, Dhaka. It is a referred journal and publishes articles in the areas of economics, central banking, commercial banking and

finance as well as problems of economic development, in particular of Bangladesh and also other developing countries. While sending papers for publication in the Journal, the contributors are requested to follow the following rules:

Submission Criteria

1. Articles should be typed in double space on one side of A4 size paper with generous margin and should not usually exceed 6000 words (including footnotes, tables and graphs). Each article should have an abstract within approximately 150 words. The hardcopy of article should be sent in duplicate, along with a soft copy in MS word.
2. The author should not mention his name and address on the text of the paper. A separate sheet bearing his full name, affiliation, mailing address and telephone number should be sent along with the main paper.
3. Articles submitted for publication in the journal must not have been accepted for publication elsewhere.
4. Tables, graphs and maps may be used in the article. The title and sources of such tables, etc. should be mentioned.
5. If the Editorial Board is of the opinion that the article provisionally accepted for publication needs to be revised, shortened. or particular expressions therein need to be deleted or rephrased, such requested to recast any article in response to the comments made thereon by the reviewers.
6. The numbering of the footnote will be consecutive, and the footnotes themselves will be placed at the end of the article.
7. Articles, not accepted for publication, will not be returned to the author.
8. A token honorarium of BDT 10,000.00 will be paid for each published article.

References

References should be furnished according to APA style of citation and referencing.

Page Setup

Paper size: A4, top & bottom margin: 2" (two inches), left & right margin: 1.5" (one point five inches), header & footer: 1.6"(one point six inches), font name: Times New Roman, font size for the title of the article: 16 bold, font size for the caption of the paragraph: 12 bold, font size for general text: 11 and font size for the abstract, footnote and references: 10

Book Review

New books (on economics, central banking, commercial banking and finance and as well as recent economic development) will be reviewed in the journal on request. Authors/ publishers may send two copies of each book to the editor for the purpose of review.

All communications should be addressed to the following:

Executive Editor
Thoughts on Banking and Finance
General Manager
Research and Publications Wing
Bangladesh Bank Training Academy
Mirpur-2, Dhaka-1216
Telephone: +88-02-48040816, +88 01746614781, Fax: +88-02-8032110
E-mail: bbta.respub@bb.org.bd

Introduction to Bangladesh Bank Training Academy (BBTA)

Bangladesh Bank Training Academy (BBTA) is a training wing of central bank of Bangladesh, Bangladesh Bank pursues tasks of capacity building and human capital development in order to prepare skilled human resources in central bank as well as for commercial banks. BBTA organizes different training courses, training workshops, conferences, seminars and other related activities on main topics of economics, banking and finance, financial sector development, human resources development and macroeconomic management. It was established in 1977.

BBTA's Mandate

The purpose of the Academy is to undertake training activities for enabling the officials of central bank and the banking sector to perform their jobs efficiently well-equipped with the latest knowledge of economic, financial and banking developments. To this end, BBTA extends its all-out efforts to facilitate training to personnel engaged in the financial sector. It also works to modernize its library and information center to collect, systematize and disseminate information in the financial arena. Recently, a plan has been adapted to reorganize BBTA library as a Knowledge Management Centre (KMC). This new role puts more weight on BBTA for knowledge creation and application. Since information is important to create new knowledge for educating staff and professionals, we hope that it would contribute to the creation of knowledge and disseminate knowledge for use by others.

BBTA's Strategic Objective's

Bangladesh Bank has adopted its 5-year Strategic Plan 2015-2019 and bestowed responsibilities upon BBTA (Strategic Goal # 8) to adopt all-out efforts to enhance professional excellence and grooming of the officers of Bangladesh Bank. To fulfill the target of the plan document, BBTA has been employing its full capacity to provide need-based training to the officials both from central bank and commercial banks; continuously striving to diversify the contents of its courses in order to ensure their consistency with evolving training needs; facilitating the practical application aspects of knowledge of economics, banking and finance; and developing training as a scientific discipline.

In order to achieve the above mentioned strategic objectives, BBTA has introduced the following initiatives.

1. Building and enhancing training capacities of the trainers;
2. Improving quality, efficiency, impact and cost-effectiveness of training programs;
3. Linking training with real-world cases and experiences;
4. Building training partnership programs with the public and private sector domestic and overseas training institutions;
5. Building and maintaining the BBTA financial institutions information system,
6. Utilization of the Internet for dissemination of the Academy's biannual Journal 'Thoughts on Banking and Finance';
7. Building a database on trainers and training institutions in the field of banking and finance; as well as
8. Facilitating the digitization of BBTA documents.

Organization

The Executive Director is the head of the Academy. There are seven wings to look after the administration, training and research programs of the Academy.

Location

The Academy is located in Mirpur-2, Dhaka-1216, Bangladesh.

Mailing Address

Bangladesh Bank Training Academy
(BBTA) Mirpur-2, Dhaka-1216, Bangladesh
Telephone: +88-02-48040816
Fax: +88-02-803211
Web: www.bb.org.bd

ISSN - 2517-9918

Published : by G. M. Abul Kalam Azad, General Manager, Department of Communications and Publications, Bangladesh Bank, Head Office, Motijheel, Dhaka-1000, Bangladesh. e-mail : abul.kalam@bb.org.bd, Meghna Printers, 16 Nillkhet, Kataban, Dhaka-1205

DCP-04-2021-300