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Editorial Note

Since 1982, private commercial Bank (PCBs) started to make notable improvements in selecting appropriate borrowers for providing loans and by monitoring the borrowers closely, PCBs could reduce the amount of non-performing loans. Besides, proactive regulatory measures taken by the central bank, such as guidance regarding prudential norms of capital adequacy, classification of loans, on-site and off-site supervision, have strengthened PCBs foot in banking operation. Profitability indicators too show PCBs' improving performance in the banking industry. At the same time, PCBs began to experience increasing amount of liquidity. It is interesting to examine the nature of relationship between liquidity and bank profitability. The first paper in this issue examines this issue using data on some selected banks of Bangladesh. The findings of the paper may provide insights for improving banks' performance through better asset and liability management.

From the days of Walter Bagehot, a number of economists have elucidated the influence of financial development on economic growth. An extensive empirical literature has subsequently established the relationship, but it is conditioned by the cultural and legal environment, so that the positive effects of financial development on economic growth might not exist within any given national context. However, though an extensive body of literature is available, it is not clear that, for any given country, financial development will necessarily lead to economic growth. Given this backdrop, the second paper of this journal aims to extend the existing literature by examining the case of Bangladesh.

Banking competition is an exceedingly important issue as banks play a vital role in the economy.

Competition negatively influences the performance of banks in terms of profitability and efficiency. As in any other industry, competition can also affect the efficiency and the degree of innovation in the banking sector. It is recognized in many studies that there is a link between competition and stability. This link has also helped to formulate many prudential policies towards banks (Vives, 2001). Obviously, competition in the banking sector has a major impact on the wealth of consumers and companies and it affects the performance and financial health of banks. The drivers for assessing the level of competition are banking sector liberalization, financial markets deregulation, financial innovations, merger and consolidation etc. So far few studies attempted to measure the competition of commercial banking industry of Bangladesh. The third paper attempts to contribute to the burgeoning literature on banking competition in a number of ways.

Bangladesh is one of the top-ranked remittances receiving country of the world. Remittances have significant impacts on living standard of recipient households, by easing national saving-investment and exports-imports gap, and by accumulating foreign exchange reserves. Though there are many studies dealing with macroeconomic determinant of remittances in major recipient's countries, surprisingly, few are available on Bangladesh. To fill in this gap, the fourth paper empirically examines the determinants of remittances in Bangladesh using a gravity model approach that adds to the existing literature on migration and remittances in Bangladesh.

Exchange rate is an important variable which influences decisions taken by the participants of the foreign exchange market, namely investors, importers, exporters, bankers, financial institutions, business, tourists and policy makers both in the developing and developed world as well. Though exchange rate was stable in the initial stage of floating regime in Bangladesh, sharp depreciations occurred during August 2004 to April 2006 and again injury 2010 to January 2012. As excessive fluctuation of exchange rate can be an obstacle to macroeconomic stability, it is important to know the sources of fluctuations in both the phases. Timely forecasting of the exchange rates is able to give important information to the decision makers as well as partakers in the area of the internal finance, buy and sell, and policy making. The fifth paper in this journal attempts to forecast exchange rate using time series econometric techniques.

Interestingly, depreciation of Indian Rupee in terms of Bangladeshi currency is a recent phenomenon which is worth mentioning. However, it is not because of Bangladeshi currency is getting stronger against the common currency dollar. The macroeconomic implications of this economic incident are far-reaching. At present India is the largest trade partner of Bangladesh and currently the value of Bangladeshi imports from India is worth $4.5 billion per year. In contrast, Bangladesh exports merely $600 million a year in Indian market. Due to this appreciation common trends show, Indian export to Bangladesh will increase and Bangladeshi export to India will be decreased. And, this new direction of trade may widen the existing huge trade deficit further for Bangladesh. The sixth paper of this journal is an endeavor to identify the causes and impacts of Indian Rupee depreciation on Bangladesh economy.

Amidst a number of social and economic problems, banking sector in Bangladesh has been growing significantly. However, there is a dearth of studies that has made efforts determining the crucial factors that customers perceive as important in their choices of bank selection. The seventh paper in this edition also aims to fill the gap in research.

The effectiveness of monetary policy in Bangladesh depends on to what extent central bank has control over its reserve money which depends on many factors including how the components of reserve money behave over time. The very last paper of this current issue strives to examine the effectiveness of monetary policy on the economic activity by analyzing the components of reserve money and their short term and long run relationships with reserve money.

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Nexus between Bank's Liquidity and Profitability in Bangladesh: An Overview

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Abstract

The main objectives of the paper are to investigate the relationship between banks' liquidity and profitability, and the impact of liquidity on bank's profitability. The paper applies Ordinary Least Square (OLS) method for the sample period 1997-2014 to examine the impact of liquidity on banks' profitability. The paper finds that advance-deposit ratio which measures liquidity positively impacts banks' profitability. Call money rates, non performing loans (NPL) and excess liquidity- negatively impacts banks' profitability. The negative relationship between NPL and return on asset (ROA) is a major concern of the policymakers of the banking industry of Bangladesh.

Keywords: Liquidity, Profitability and Banking Industry.

Introduction

In the recent time, banking industry faces two challenges, i.e., pressure of huge liquidity and declining of earning profit. The management of these two factors are very important for healthily growing of banking business. For example, the liquid assets and excess liquidity as percent of total asset were 20.6 percent and 9.0 percent respectively in 2009 which increased to 27.4 percent and 17.3 percent in 2014 in the banking sector. Profitability as measured by return on asset(ROA), on the other hand, declined from 1.4 percent in 2009 to 0.6 percent in 2014 (Annual Report 2013-2014, BB). The findings of the present study has relevancy of policy implication in the management of liquidity to maintain profitability in banking industry of Bangladesh.

The trade-off between banks' liquidity and profitability depends on the demand and supply of liquidity in the banking sector. Banks have to maintain adequate liquidity to meet the

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demand of funds at the time needed at a reasonable cost. When the banks' demand for liquidity is higher than the supply then bank either sell its liquid asset or borrow funds to meet the deficit which impacts on profitability of the bank[2]. On the other hand, when the bank's supply of liquidity exceeds its demand bank loss some earnings which also impact on bank's profitability. That is excess liquidity indicates idle funds that don't fetch any profit. On the other hand, insufficient liquidity might deteriorate bank's credit that would lead to forced liquidation of banks assets. Therefore, Bank's liquidity plays an important role for the bank's profitability. In this regard, it is important to find out the relationship between liquidity and profitability in the banking sector of Bangladesh.

Although there are various indicators of earnings and profitability, the most representative and widely used indicator is return on assets (ROA), which is supplemented by return on equity (ROE) and net interest margin (NIM)[3]. The profitability of the banking sector, as measured by which was declining up to 2000 and after 2005 it increasing up to 2010. Afterwards, it again declined till 2013. The advance-deposit ratio (ADR) is one of the most useful indicator for banks' liquidity adequacy. The higher ratio of ADR may indicate a stress in the banking system and a low level of liquidity to respond to shocks. The lower ratio of ADR, on the other hand, indicates an increasing ability of the banking system to mobilize deposit to meet credit demand. The ratio was above 84 percent during 1997-1999. Afterwards, it showed a downward trend and it reached 71 percent in 2013.

On the other hand, it is observed that deposit and credit[4] growth exhibited more or less a steady upward trend during 1997-2011. After 2011 both trends reveal downward trend. Deposit may be downward due to slower rates of increase in deposit from the households due to high inflationary pressure (10.62 percent). The dropping in credit was due to the fact that in 2011, BB instructed banks to maintain their ADR within a certain level by June 2011, because the interbank money market faced some liquidity stress at the end of 2010 which continue throughout the year 2011. Thus, it is important for the policy makers to understand the relationship between liquidity and profitability in the banking sector in Bangladesh so that they can formulate the appropriate liquidity management policy for commercial banks.

Commercial banks in Bangladesh maximize their profit by managing assets and liabilities efficiently. Though banks' objective is to maximize profits, they are concerned about banks liquidity and safety. Banks earn profits for their shareholders and at the same time satisfy the withdrawal needs of its customers and meet the demand of regulatory requirement (i.e.,

2 Rose (2002) describes the essence of the liquidity management problem in two succinct statements. The two statements are: (1) it is rarely matches the demand for and supply of liquidity of bank at any particular time, (2) there is a trade-off between bank liquidity and profitability.

3 ROA=net income after taxes/total asset ROE=net income after taxes/total equity capital NIM=net income after taxes/ total income

4 Credit= advances + bills + Investment (excluding interbank).

maintain CRR and SLR set by the Bangladesh Bank). However, banks' day to day required liquidity can be decided within their demand-supply framework (Annexure Table-1). Hence, it is very difficult for a bank to achieve the goal of the profitability and also keep an adequate liquidity at the same time.

Against this background, the main objective of the paper is to investigate the relationship between liquidity and profitability as well as the impact of liquidity on banks' profitability of banking industry as a whole. The paper examines the impact of liquidity on banks profitability by applying ordinary least square method (OLS). The study uses secondary dataset for the analysis. The annual data have been collected from the Economic Trends of Bangladesh Bank, Annual Report of Bangladesh Bank, Bangladesh Bank Quarterly, Financial Stability Report of Bangladesh Bank and Bangladesh Economic Review, Ministry of Finance. The yearly data has been used for the period from 1997 to 2014. The rationale for using this period is that after the expiry of Financial Sector Reform Project (FSRP) in 1996, the Government of Bangladesh formed the Banking Reform Committee to evaluate the situation in the banking sector. Besides, in 1997, Commercial Bank Restructuring Project (CBRP) has been undertaken to take progress on key issues and urgent actions were needed for the development of commercial banks. Meanwhile, an international standard-based audit of the loan portfolio, assets / liabilities and capital adequacy had to be formed in all banks in order to make full and proper disclosure of their financial position.

The paper finds a positive relationship between advance deposit ratio and profitability. The call money rate varies negatively with banks' profit which- indicates that banks meet their liquidity deficit with higher cost. As a results, higher cost of funds impact banks profit inversely. Accordingly, the estimated result shows a negative relation between -NPL and profitability, and excess liquidity and profitability.

The remainder of the paper is organized as follows: Following the introduction in section I, review of the literature is given in section II. Section III highlights the measurement and determinant of liquidity and profitability. Section IV gives a details scenario of liquidity and profitability in the banking sector of Bangladesh. Section V analyses model specification, variable definition and methodology. Section VI describes the estimated results , and finally section VII gives the conclusion.

Section II: Review of Literature

Hossain (2012) investigates the liquidity and profitability of the banking sector of Bangladesh. He finds that the overall banking industry of Bangladesh is maintaining excess liquidity during 2002 to 2010. He also finds that foreign commercial banks (FCBs) are more profitable than private commercial banks (PCBs) and state-owned commercial banks (SCBs). The reasons behind higher profitability of FCBs are: i) their weighted average net interest spread is higher, ii) non-performing assets are much less than others, and iii) their non interest income is higher than SCBs and PCBs. This paper only reveals the liquidity

and profitability position of the banking industry, but nothing is highlighted regarding the management of the liquidity.

Afia et al (2014) examine the liquidity-profitability relationship in the Bangladesh banking industry by using yearly data during 2006-2011. They considered twelve banks in four different sectors (Government banks, Islami banks, multinational banks and private commercial banks) by using linear regression model. They use only two variables i.e., liquidity (current ratio= current asset/current liabilities) and profitability (return on asset--ROA). They find that individually all the sectors show no significant relationship between liquidity and profitability at 10 % level of significant. Even the overall banking industry also shows the same result.

Junaidu et al. (2014) check the impact of liquidity on the profitability of Nigerian banks for the period 2003-2012. Five banks were selected as the sample size to cover the period of the study. They used ROA and ROE as dependent variable. On the other hand bank liquidity is measured using loans and advances to total assets, and cash and bank advances to total liabilities, which they use as independent variable. Linear regression were used in the analysis. They find that there is a positive relationship between ROA and cash and bank balances to total liabilities (CBTOTL) and return on equity (ROE) and cash and bank balances to total liabilities but negative relationship between ROE and Loans and advances to total assets (LATOTA). Finally, they find that there is no significant impact between liquidity and profitability among the listed banking firms in Nigeria.

Wambu (2013) explores the relationship between profitability and liquidity of 44 commercial banks in Kenya during 2008-2012. The study used descriptive statistics and regression analysis to establish the relationship. In the regression analysis the paper use current ratio and CBK liquidity ratio which is the percentage of net liquid assets as a proportion of net deposit liabilities as independent variable. The paper concludes that profitability and liquidity have a positive relationship but liquidity is not a significant determinant of commercial bank's profitability but one of the determinants of it.

Munther et al. (2013) investigate whether liquidity through quick ratio has significant impact on Jordanian banks profitability through return on asset (ROA) for the period 2005-2011 of 15 Jordanian banks listed at Amman Stock Exchange (ASE). They use simple regression model for the analysis. The study revealed that there is significant impact of independent variable quick ratio (Cash+ Short-term marketable investments +Receivables Current liabilities/Current liabilities) on dependent variable return on asset (ROA) at 5% level of significant.

The above mentioned studies explain the relationship between liquidity and profitability in the banking sector in different countries. Most of these paper use only two variables, but there are numerous variables (bank specific and macroeconomic) those can influence the relationship. To fill up this gap we have taken this empirical study. We use bank specific variables as well as macroeconomic variables for the analysis. In Bangladesh recent financial scam (Hall mark and BASIC Bank) and huge loan default erodes the asset

quality which impact on profit earnings of the banking sector. 5 Besides, it not only impacts profit earnings but also banking sectors resilience and stability. Maintaining stability and profitability of the banking sector are now the major concern for the policy makers. We think that the findings of the paper gives some thought to the policy maker.

Section III: Measurement and Determinant of Liquidity and Profitability

A. Measurement and Determinant of liquidity

The measurement of liquidity and its management are very important for earning profit. If any bank holds more liquid asset, it fall in strong liquidity holding bank categories. Among the most popular liquid assets for banks are Treasury Bills, government bond, call money loans, and deposits held with other bank etc. A bank is liquid only if it has access, at reasonable cost, to liquid funds in exactly the amounts required at the time they are needed (Rose, 2002). There is a opportunity cost to storing liquidity in asset when those assets must be sold in order to raise cash. Besides, liquid assets generally carry the lowest rates of return of all financial assets.

Maintaining a sound and appropriate liquidity position is one of the significant indicators of a bank's performance. Without ensuring the adequate liquidity the banking sector will fail to mobilize its resources for earnings profit. The sources and uses of funds method show that bank liquidity rises as deposits increase and loans decrease. On the other hand bank liquidity decline when deposits decrease and loans increase. Regarding this, the advance-deposit ratio (ADR) is one of the most useful indicators of adequacy of banks' liquidity[6]. The higher ratio of ADR indicate a stress in the banking system and a low level of liquidity to respond to shocks (Evans et al. 2000). The lower ratio of ADR, indicates an increasing ability of the banking system to mobilize deposit to meet credit demand. Banks may earn higher profit by increasing the ADR although it indicates lower liquidity. Bangladesh Bank (BB) is currently measuring the ADR ratio as a gross measure to calculate the liquidity condition prevailing in the banking sector[7].

The credit and deposits growth play an important role in liquidity in the banking industry. The demand of credit or loan (advances) depends on many factors, i.e., expected GDP growth, corporate earnings, inflation rate, interest rate of lending, and money supply target by the monetary authority. Accordingly, deposits growth also depends on many factors, i.e., expected personal income (per capita income), trend of yield in money market deposits, and inflation.

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5 The kingpin of the country's biggest banking scam, Hallmark Group, has embezzled around Tk 1,492 crore from Ruposhi Bangla Hotel branch of Sonali Bank by creating 804 letters of credit in a single day. Another scam was Basic Bank approved loans of Tk 4,500 crore, mostly without proper documents and scrutiny.

6 Deposit are the main sources of funding for the banking sector in Bangladesh in addition to the capital, reserves and borrowings. Banks mainly use their funds to provide loans and invest in debt securities. The ADR, is, therefore, a useful indicator of banks' liquidity in Bangladesh.

7 ADR is the ratio of total advance to total deposits, where advance comprise all banking advance except interbank advances and inland and foreign bill purchases when these bills are funded.

Sometimes fiscal performance also influences liquidity in banking industry. If government heavily borrow from banking system for deficit financing then banking system faces pressure of liquidity. So, government borrowing from the banking system is another indicator of liquidity situation. Government borrowing from the banking system would create an extra burden to the banking sector by creating liquidity shortage. On the other hand, banks borrowing from central bank often reflects liquidity situation in the financial system. Besides, interbank call money rate is an important indicator for evaluating liquidity position in the banking sector. The reduction in call money borrowing and investment and a stable call money rates within the lower ranges indicated that the banks were able to ease down from their earlier condition of liquidity stress. Another very important market to assess the liquidity scenario is the interbank repo market. The interbank repo rates more accurately indicates the money market conditions, because the rates are determined based on the demand and supply orientations in the money market.

B. Measurement and Determinant of Profitability

There are various indicators to measure profitability in the banking industry. The common indicators are return on asset (ROA), return on equity(ROE), non interest margin, and net interest margin (NIM)[8]. The ROA is derived as banks net income divided by its total asset. Thus ROA is primarily an indicators of managerial efficiency and it indicates how capable the management of the banks has been converting the institution's asset into net earnings. The ROE is derived as banks net income divided by its total equity capital. It measures the rate of return flowing to the bank's shareholder. The NIM measures how large a spread between interest revenues and interest costs management able to achieve by close control over the bank's earning assets and the pursuit of the cheapest sources of funding. The non interest margin measures the amount of non interest revenue stemming from deposit services charges other service fees the bank has been able to collect relative to non interest costs.

A bank will be profitable when its total' revenues exceeds its relevant expenses (Niresh, 2012). Strong earnings and profitability profile of a bank reflect its ability to support present and future sound operation, absorb future contingent shocks and strengthen resilience capacity. A low profit would suggest ineffective management and investors would be hesitant to invest in the bank. More specifically, strong earnings influence the capacity to absorb losses by building an adequate capital base, finance its expansion and pay adequate dividends to its shareholders.

There are common determinants which influences bank's profitability such as cost, size,

8 ROA=net income after taxes/total asset. It indicates how capably the management of the bank has been converting the institutions' assets into net earnings. ROE=net income after taxes/total equity capital. It measure the rate of return flowing to the banks' shareholders. NIM=net income after taxes/total income. It indicates how well management and staff have been able to keep the growth of revenues ahead of rising costs.

capital, liquidity, non-performing loan, management efficiency and credit risk etc. Bank size is generally used to capture potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences and product and risk diversification according to the size of the credit institution. The impact of a bank's size on its profitability is not uniform. The first factor could lead to a positive relationship between size and bank profitability, if there are significant economies of scale, while the second to a negative one, if increased diversification leads to lower credit risk and thus lower returns.

Operating costs of a bank as a percentage of its profits are expected to have a negative correlation with profitability. In the literature, the level of operating expenses is viewed as an indicator of the management's efficiency. On the other hand, banks with higher levels of capital perform better than their undercapitalized peers. Bank profits provide an important source of equity especially if re-invested into the business. Besides, Insufficient liquidity is one of the major reasons of bank failures. However, holding liquid assets has an opportunity cost of higher returns. In addition, changes in credit risk may reflect changes in the health of a bank's loan portfolio, which may affect the performance of the institution.

Another group of variables impacting bank profitability are macroeconomic control variables such as GDP, interest rates and inflation. GDP is one of the most common measures of the total economic activity within a country. In the literature, the growth of GDP has significant positive effect on the profitability of the financial sector. Inflation is often cited to be a significant determinant of bank profitability (Weersainghe and Perera, 2013).

Section IV: Liquidity and profitability Scenario in the Banking Sector in Bangladesh

A. Liquidity:

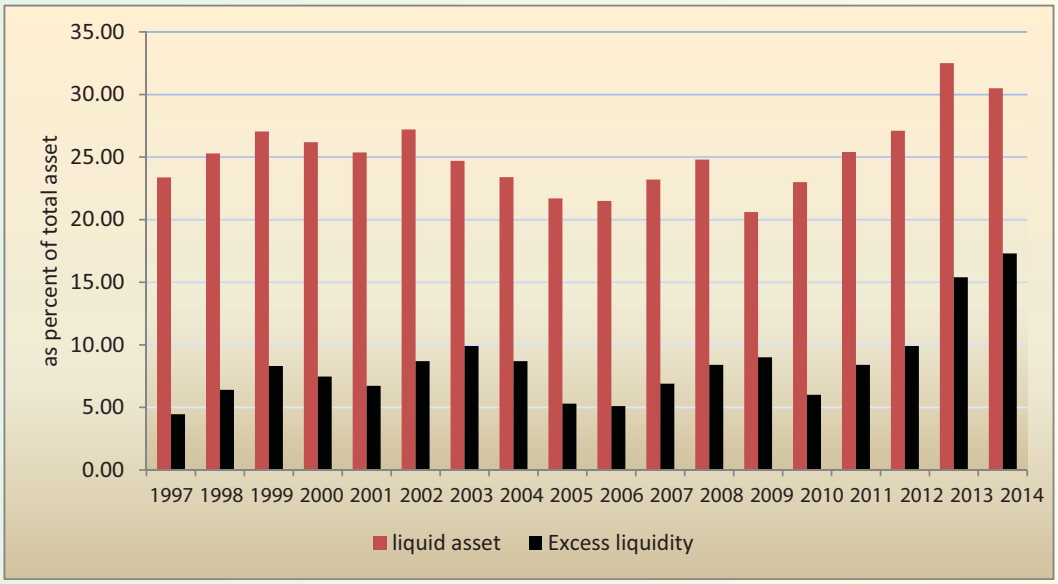
Figure-1 demonstrates that liquidity showed a mixed trend during 1997-2009[9]. After 2009, it showed an increasing trend due to BB's measures to improve liquidity position in the banking sector[10] Accordingly, excess liquidity shows an upward trend during 2007-2014 (except 2010 when banking sector faced liquidity crisis). During 1997-2014, total liquid

9 Bangladesh Bank defines liquidity position of the scheduled banks as total liquidity = Cash in tills + balance with Sonali bank + balance with BB + investment in unencumbered approved securities. Excess liquidity = total liquid asset- required liquid asset (CRR +SLR).

10 In order to maintain ensuring good corporate governance in banks for overcoming liquidity and solvency problems caused by poor governance, BB initiated two Basel III-liquidity standards, namely the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) to the banks as a reporting requirement in 2011. In addition, BB introduced a liquidity monitoring tool named 'Interbank Transaction Matrix' covering all the banks and NBFIs with a view to assessing the risk arising from the liquidity interdependence and placements among the institutions in the banking system.

asset of the banking sector was on average 24.73 percent of total asset and excess liquidity was on average about 7.82 percent[11].

Figure 1: Trend in Liquidity: sample period 1997-2014

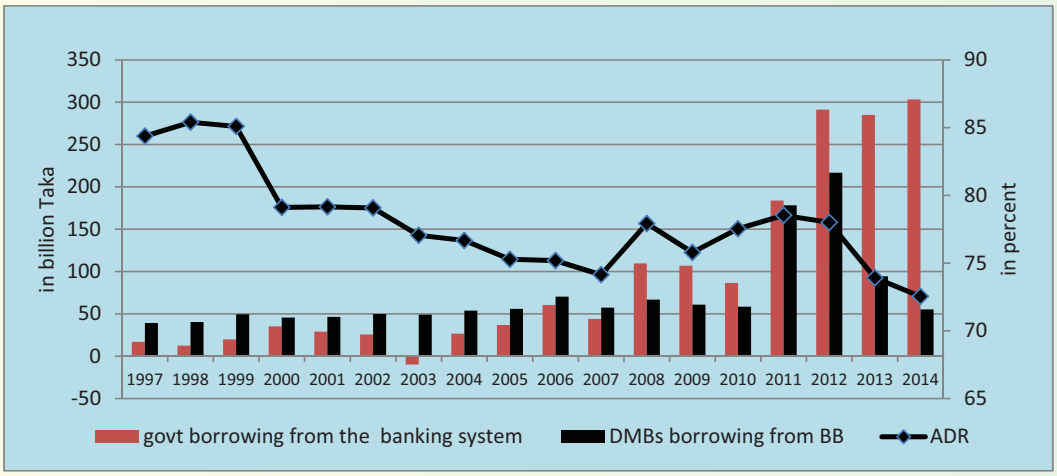


During 1997-2014, the ADR showed a mixed trend. The ratio was above 84 percent during 1997-1999. Afterwards, it showed a downward trend till 2009 and again it increased during the 2010-2012 period (Figure-2). The higher growth in advances may be attributed to increase in business activities due to recovery from the global financial crisis. The interbank money market faced liquidity stress at the end of 2010 and it continued throughout the year 2011, which was due to high government borrowings and a slower rates of increase in savings from the households due to high inflationary pressure. However, activities quickly turned to a business-as-usual situation with supportive measures taken by the BB and prudent policies of the financial institutions. The ADR started declining from 81.1 percent in January, 2012 to 73.18 percent in December 2013 and reached 72.54 percent in 2014. This dropping of ADR was due to the fact that the growth in deposits was higher than that of credit in 2013. Banking sector deposit and credit growth were 16.26 percent and 7.41 percent respectively in 2013. A volatile political environment that discouraged credit growth due to reduced business confidence also partially explains the scenario.[12]

11 Liquid asset=percent of liquid asset in total asset Excess liquidity=percent of excess liquidity in total liquidity.

12 Bangladesh has experienced a political turmoil during October to December, 2013 when non-stop blockade and continuing general strikes (*hartal*) accompanied with significant violence, afflicted considerable losses of the economy, which severely disrupted day-to-day economic activities resulting reduce the business confidence and bank credit.

Figure 2: Trend in Liquidity Indicator in the Banking System: sample period 1997-2014



Source: (1) Annual Report, BB, (2) Economic Trends, BB, (3) Bangladesh Economic Review, Ministry of Finance.

The overall ADR also influenced by the government borrowing from banking system. Government borrowing from the banking system would create an extra burden to the banking sector by creating liquidity shortage. It is envisaged from Figure-2 that government borrowing from the banking system was started to increase from 2008 (except 2010 due to prevailing liquidity crisis in the banking sector) and after 2010, it increased significantly. Consequently there was huge liquidity crisis in the banking sector. A rising trend of credit to the Government by the banking system may create strain on the lending capacity of scheduled banks.

It is observed that banks borrowing from BB showed a mixed trend during 1997-2014. An increasing trend was exhibited from 1997 to 2006. It declined from 2007 and started to increase significantly in 2011 and 2012 which indicates a liquidity crisis in the banking sector. It decreased substantially in 2013 and 2014 (Figure-2).

Interbank money market is an important indicator for evaluating liquidity position in the banking sector. It is observed that investment in call money market decreased by 11.61 percent while, borrowings increased by 30.96 percent in 2010 from its previous year (Table-1). It is mentioned that the interbank money market faced some liquidity stress at the end of 2010. BB's instruction to increase the Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) in December 2010, along with rising import payments and diversion of cash to the stock market, created some temporary pressures in the interbank liquidity market. However, investment in call money market increased dramatically by 191.5 percent while, borrowings from call money market increased by only 41.5 percent in 2011 compared to that of 2010. It is noteworthy that the interbank money market faced liquidity

stress throughout the year 2011 and the banking sector ADR demonstrated a surge at the beginning of 2011. The stress was released in 2012 as more banks improved their ADR.

The call money rates declined from the early part of 2013 until June 2013, after which it increased slightly and fluctuated marginally during the rest of the year. This low call money rates and reduced amount of call money borrowings indicated that the banks were able to ease down from their earlier condition of liquidity stress. In 2013, call money borrowing also decreased substantially and slightly increased in 2014. The reduction in call money borrowing and investment and a stable call money rates within the lower ranges indicated that the banks were able to ease down from their earlier condition of liquidity stress (Table-1).

Another very important market to assess the liquidity scenario is the interbank repo market. The interbank repo rates more accurately indicates the money market conditions, because the rates are determined based on the demand and supply orientations in the money market. From 2011 the volume and rates for repo increased substantially which also indicates liquidity stress. In 2013 the repo turnover decreased, and then increased a little during the latter half of the year, but the repo rates decreased continuously which again suggest adequate liquidity in the banking system. The relatively higher turnover might be due to fund management strategies of the banks. The prevailing very low ADR, decreasing call money rates and repo rates indicates that banking industry is currently having substantial liquidity.

Table-1: Trends in the interbank money market developments.

	CY09	CY10	CY11	CY12	CY13	CY14
Borrowings (in billion Taka)	121.98	159.75	226.2	316.0	221.6	244.9
Investment (in billion taka)	49.70	43.93	128.1	66.8	46.5	63.32
Call money rate	4.39	8.06	11.16	12.82	7.78	7.93
Repo rate	4.5	5.5	7.25	7.75	7.25	7.36

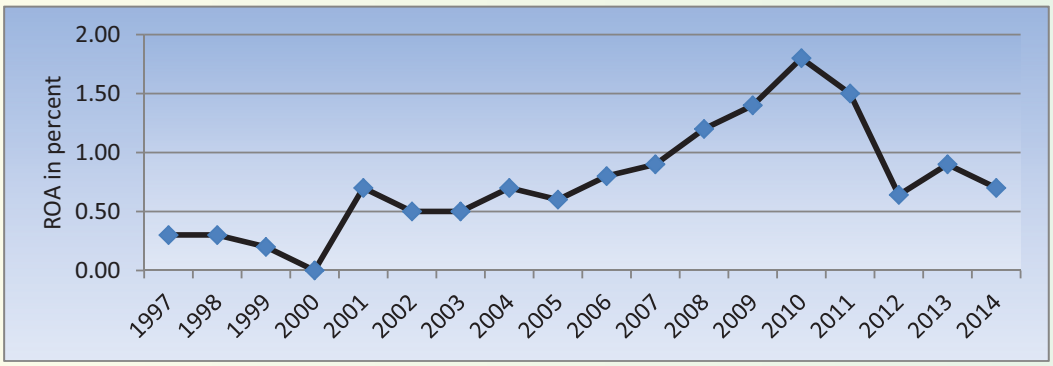
Source: Financial Stability Report (various issue), BB. Note: CY= calendar year

B. Profitability:

Figure-3 shows that the profitability of the banking sector, as measured by return on asset (ROA), showed a mixed trend during the period from 1997 to 2005. It has a declining trend up to 2000. During 2001-2004 it showed mixed trend and after 2005 it exhibited upward trend and picked in the year 2010. This may be due to increased in credit growth which is attributed to increase in business activities due to recovery of global financial crisis. Besides, non- performing loans were 7.1 and 6.2 in 2010 and 2011 respectively which was 34.9 percent in 2000 (Annexure, table-4). After 2010 ROA exhibited downward trend. BB instructed the banks to maintain their advance deposit

ratio (ADR) within a certain level (for conventional banks up to 85 percent and for Islamic shariah based banks up to 90 percent) by June 2011[13]. In addition, after 2011, non - performing loan also increased and stood at 10.8 percent in 2014. As a result, credit as well as ROA showed downward trend.

Figure 3: Trend in profitability: sample period 1997-2014



Source: Annual Report, BB

Table-2 exhibit the bank group wise ROA. The ROA in the banking industry increased gradually to 1.80 percent in 2010 from 0.70 percent in 2001. Afterwards, it declined to 0.6 percent in 2012. An analysis of the indicator reveals that the ROA of the state owned commercial bank (SCBs) was less than banking industry average. During 2008-2011, it showed an increasing trend, but it declined to -0.6 percent in 2012 due to financial scam and a huge default loan which incurred a big net loss. In 2013 the ROA of SCBs increased and became positive at 0.60. The DFIs situation is not better due to persistent operating losses incurred by Bangladesh Krishi Bank (BKB) and Rajshai Krishi Unnayan Bank (RAKUB). The ROA of DFIs deteriorated (0.4 percent) in 2013. The ROA of the PCBs showed a consistently strong position until 2010, but it slightly dropped in 2011 and 2012 due to a decrease of net profit during the period. In 2013, it didn't drop from the previous year. Though ROA - of foreign banks (FCBs') has been consistently strong during the last couple of years, it decreased slightly in 2013 and again increased in 2014 (Table-2).

13 BB is currently measuring the ADR (advance deposit ratio) as a gross measure to calculate the liquidity condition prevailing in the banking sector.

Table-2: Trend in Return on Assets (ROA) by Types of Banks

Year/Bank Type	SCBs	DFIs	PCBs	FCBs	Total
1997	0.00	-2.10	1.10	4.80	0.30
1998	0.00	-2.80	1.20	4.70	0.30
1999	0.00	-1.60	0.80	3.50	0.20
2000	0.10	-3.70	0.80	2.70	0.00
2001	0.10	0.70	1.10	2.80	0.70
2002	0.10	0.30	0.80	2.40	0.50
2003	0.10	0.00	0.70	2.60	0.50
2004	-0.10	-0.20	1.20	3.20	0.70
2005	-0.10	-0.10	1.10	3.10	0.60
2006*	0.00	-0.20	1.10	2.20	0.80
2007*	0.00	-0.30	1.30	3.10	0.90
2008	0.70	-0.60	1.40	2.90	1.20
2009	1.00	0.40	1.60	3.20	1.40
2010	1.10	0.20	2.10	2.90	1.80
2011	1.30	0.10	1.60	3.20	1.50
2012	-0.60	0.10	0.90	3.30	0.60
2013	0.60	-0.40	1.0	3.0	0.90
2014	-0.55	-0.68	0.99	3.38	0.60

Source: Annual Report & Bangladesh Bank Quarterly (various issues), BB. * Due to provision shortfall NIAPT (net income after provision and taxes) of 4 SCBs are administratively set at zero. Therefore, ROA for the 4 SCBs are zero.

Aggregate net interest income (NII) of the industry has increased constantly from Taka 6.3 billion in1997 to Taka 153.8 billion in 2012. In 2013, NII fell down to Taka 132.3 billion reflecting mainly in the negative NII of Taka 5.4 billion by the SCBs (Table -3). The NII of the SCBs was a negative amount of Taka 1.2 billion in 2000 and it turned to positive Taka 7.7 billion in 2005. In 2001, the NII of SCBs was Taka 14.9 billion. Since 2005, SCBs have been able to increase their net interest income (NII) by reducing their cost of fund up to 2011. In 2012, the NII of SCBs dropped and in 2013 it was negative due to high interest expenses which grew faster than interest earnings. The DFIs had a positive trend since 2000 and it was Taka 4.7 billion in 2012 but afterwards it showed a decreasing trend. The NII of the PCBs has been incredibly high over the period from 2003 through 2013. The trend of NII indicates that the interest spread of PCBs and FCBs is higher (Annexure

Table-2) than that of SCBs and DFIs (BB, Annual Report)[14].

Table -3 Net Interest Income (NII) by type of Banks (in billion Taka).

Year	SCBs	DFIs	PCBs	FCBs	Total
1997	2.7	-0.1	1.7	2	6.3
1998	2.2	0.5	2.3	2.2	7.1
1999	3.1	-0.1	3	1.8	7.8
2000	-1.2	1	6.1	2.5	8.4
2001	-1.8	2.7	9.2	3.3	13.4
2002	-1.5	1.4	10.2	3.4	13.5
2003	-0.3	1.3	12	3.6	16.6
2004	-1.1	1.8	13.7	4.2	18.3
2005	7.7	1.0	21	5.6	35.3
2006	9	1.7	25.4	8.2	44.3
2007	7.4	1.4	36.1	9.9	54.8
2008	7.9	1.9	48.5	12.6	70.9
2009	12.1	1.9	56.7	10.7	81.5
2010	19.8	6.2	82.8	13.0	121.9
2011	34.3	4.9	91.4	16.1	146.7
2012	14.9	4.7	114.7	19.6	153.8
2013	-5.4	3.8	118.2	15.8	132.3
2014	39.7	2.1	205.8	26.6	274.0

Source: Annual Report (various issues), BB.

Commercial banks in Bangladesh continuously monitor their balance sheet (assets and liabilities) for balancing liquidity and risk to maximize their profitability. Banking sector aggregate balance sheet data are given in Annexure Table-3.

Section V: Model Specification Variable Definition and Methodology

a. Model Specification

Since the paper examines the impact of liquidity on profitability of the banking sector in Bangladesh, we employ the following empirical model:

$$Y_t = \beta_0 + \beta i\, Xi_t + \varepsilon i_t \text{ ---------- } (1)$$

Where Yt denotes profitability (return on asset) of bank, Xi includes a set of bank specific control variables (advanced-deposit ratio, excess liquidity ratio, lending rates, non-performing loans, call money rates). Xi also include some macroeconomic variables

14 NII is the difference between (a) interest payments the bank receives on loans outstanding and (b) interest payments the bank makes to customers on their deposits.

(inflation, GDP) those are also concern for banks liquidity as well as profitability. βi is the parameters which to be estimated. β_0 is the intercept and εi is the error term. We use aggregate banking industry's data.

b. Variable Definition

Return on asset (ROA): ROA is net income after taxes/total asset. It indicates how capably the management of the bank has been converting its assets into net earnings.

Advanced-deposit Ratio (ADR): ADR is the ratio of total advance to total deposits. The relationship between advances-deposit ratio and profitability is expected to be positive.

Lending rates : Weighted average lending rates in the banking system are taken for analysis. The relationship between profitability and lending interest rate may be positive or negative.

Call money rates: Interbank investment/borrowing rate indicates liquidity situation in the overall banking system. The relationship between call money rate and profitability may be positive or negative.

Excess liquidity-ratio: Percent of excess liquidity in total liquidity. It is expected to be negative relationship with profitability.

Non-performing loans (NPL): gross NPL to total loan. High NPL signify high non-earnings asset which expected to be negative relationship with profitability.

Liquidity-deposit ratio: Ratio of total liquidity to total deposit. It is expected to be negative relationship with profitability.

Inflation: Expected to be negative relationship with profitability.

GDP growth : Expected to be positive relationship with profitability.

c. Data and Methodology

To verify the impact of liquidity on profitability of the banking sector in Bangladesh, the paper uses the ordinary least square estimation method (OLS). The study takes secondary data for the period 1997-2014.This period (18 years) may not be enough to draw better result. The sample size of the study is small due to data unavailability in the aggregate level of banking industry which is the limitation of the study. The yearly data have been collected from (1) Monthly Economic Trend, Bangladesh Bank, (2) Annual Report Bangladesh Bank, (3) Bangladesh Bank Quarterly, Bangladesh Bank, (4) Financial Stability Report, Bangladesh Bank (5) Scheduled Banks Statistics, Bangladesh Bank (6) Major Economic Indicator, Bangladesh Bank and (7) Bangladesh Economic Review, Ministry of Finance.

VI. Analysis of the Estimated Results

Table-4 represent the descriptive statistic of the all variables. The mean of all variables which indicate a historical trend value during the period 1997-2014, are realistic. Standard deviations, measures the volatility, showed a variation during the period 1997-2014. It

is observed that mean and standard deviation for NPL are 19.81 and 12.37 respectively which show more volatile than other variables. A high mean value and volatility of NPL raises portfolio risk and erodes capital base of the banks which affects banks profitability. Volatility is also observed in advance-deposit ratio and excess- liquidity ratio during 1997-2014 which also related with banks profitability.

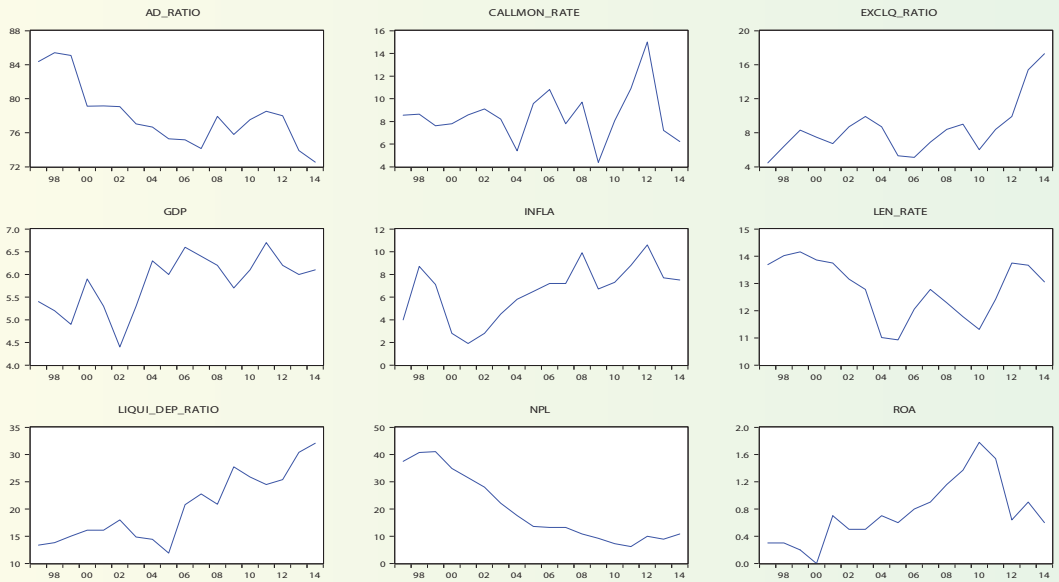
Table-4: Descriptive statistics of all variables

Variable	Mean	S. D
Advance Deposit Ratio	78.04	3.71
Call money Rate	8.52	2.32
Excess liquidity Ratio	7.82	3.29
Liquidity Deposit Ratio	19.52	5.71
GDP	5.81	0.61
Inflation	6.5	2.45
Lending rate	12.80	1.08
Non Performing Loan	**19.81**	**12.37**
Return on Asset	0.74	0.46

Source: Authors' own calculation.

Plots of the variables (Figure-4) show that all variables are stationary at level.

Figure-4 Plots of the variables used in OLS



Source: Economic Trends, BB & Annual Report, BB.

To test whether the variable used in the model are stationary or non-stationary, I used the Augmented Dickey-Fuller Test (ADF) and Phillips–Perron (PP) tests. The both tests show that all variables are stationary i.e., I(0) at level .

Table-5 : Phillips-Perron unit root tests

Variables	Model A			Model B		
	Test statistics	5% critical value	Integration	test statistics	5% critical value	Integration
A_D_R	4.47	3.06	I(0)	4.38	3.73	I(0)
INFLA	4.56	3.07	I(0)	4.41	3.73	I(0)
GDP	4.97	3.08	I(0)	4.91	3.76	I(0)
NPL	4.75	3.08	I(0)	5.00	3.76	I(0)
CLM_R	4.46	3.08	I(0)	4.09	3.12	I(0)
LN-R	3.63	3.08	I(0)	3.87	3.82	I(0)
EXLQ_R	5.23	3.12	I(0)	5.12	3.88	I(0)
LQ_DEP_R	4.80	3.06	I(0)	4.80	3.73	I(0)
ROA	4.32	3.06	I(0)	4.35	3.73	I(0)

Note: Model A includes intercept and Model B includes both intercept and trend.

Source: Monthly Economic Trends, BB, Annual Report of BB. A_D_R=advance deposit ratio, INFLA= inflation, GDP= real GDP growth rate, NPL=non performing loan to total loan, CLM_r=call money rate, LN_R=lending rate, EXLQ_R= excess liquidity ratio, LQ_DP_R= liquidity deposit ratio.

Table-6 gives a picture of the correlation between explained and explanatory variables. The table exhibit that correlation of ROA with GDP, lending rates, liquidity-deposit ratio and NPL is significant. The significant and negative correlation between ROA and NPL implies that high NPL decrease ROA. The estimated result also shows that correlation between lending rates and ROA is -0.59 which indicates that prevailing high lending rate distress ROA due lower credit demand. An estimated result of correlation coefficient between ROA and GDP is 0.51 which indicates that GDP positively impact on banks profitability.

Table-6: Estimate result of Correlation among ROA and bank specific & macro economic variables

	Variable	Correlation	t-Statistic
ROA	AD_RATIO	-0.42	-1.86
ROA	CALLMON_RATE	-0.01	-0.07
ROA	EXCLQ_RATIO	0.02	0.08
ROA	**LIQUI- DEPOSIT-RATIO**	**0.70**	**3.87**
ROA	**GDP**	**0.51**	**2.37**
ROA	INFLA	0.41	1.83
ROA	**LEN_RATE**	**-0.59**	**-2.94**
ROA	**NPL**	**-0.78**	**-4.98**

Source: Authors' own calculation.

Table-7 reveals the empirical evidence regarding the impact of liquidity on banking sector profitability. I estimate six models for the period 1997-2014 by applying ordinary least squire method (OLS) . In model-1, the explanatory variables are ADR, GDP and inflation. The result of model-1 reveals that ROA elasticity with respect to all variables are statistically insignificant impels that GDP, inflation and ADR do not influence banks profitability . In model-2 when we add NPL the estimated result show that the banking sector profitability is affected by the advance-deposit ratio and NPL. It indicates that NPL and ADR more sensitive to vary banks profitability rather than macroeconomic variables.

Then we add call money rates, lending rates, excess liquidity ratio, liquidity deposit ratio in model-3-6 respectively. Estimated result show that the banking sector profitability is affected by advance-deposit ratio, excess liquidity ratio and call money rates. The coefficients of call money rates, advance-deposit ratio and excess liquidity ratio are statistically significant with expected sign. On the other hand, lending rate and liquidity-deposit ratio are statistically insignificant.

Table-7 Results of the regression model: Dependent variable ROA.

Variable	coefficient					
	Model-1	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**
C	2.03 (0.55)	-6.96 (-2.79)	-8.12 (-3.65)	-8.65 (-3.09)	-6.49 (-2.55)	-5.86 (-2.15)
A_D_R	-0.033 (-0.94)	0.12 (3.81)	0.14 (4.87)	0.14 (4.54)	0.11 (3.72)	0.11 (3.41)
INFLA	0.050 (0.993)	-0.07 (-2.19)	-0.06 (-2.24)	0.07 (-2.14)	-0.04 (-1.40)	-0.04 (-1.39)
GDP	-0.165 (0.667)	-0.02 (-0.18)	-0.00 (0.06)	-0.02 (0.13)	-0.09 (-0.82)	-0.09 (-0.71)
NPL		-0.07 (-5.91)	-0.07 (-7.11)	-0.07 (-5.95)	-0.08 (-7.39)	-0.07 (-3.55)
CLM_R			-0.05 (-2.31)	-0.06 (-2.20)	-0.09 (-3.45)	-0.09 (-2.05)
LN_R				0.02 (0.34)	0.16 (1.93)	0.08 (0.61)
EXLQ_R					-0.06 (-2.31)	-0.06 (-2.23)
LQ_DEP_R						0.02 (0.75)
R^2	0.332	0.819	0.875	0.876	0.919	0.924
Adj. R^2	0.188	0.763	0.823	0.808	0.863	0.856
F	2.32 [0.119]	14.71 [0.000]	16.81 [0.000]	13.00 [0.000]	16.30 [0.000]	13.71 [0.000]
D_W	1.033	1.87	1.84	1.84	2.42	2.56

A_D_R=advance deposit ratio, INFLA= inflation, GDP= real GDP growth rate, NPL=non performing loan to total loan, CLM_r=call money rate, LN_R=lending rate, EXLQ_R= excess liquidity ratio, LQ_DP_R= liquidity deposit ratio. Note: Figure in parenthesis indicates t-statistic and figure in[ ] indicates probability of F statistic.

According to the estimated result in models 2- 6 the coefficient of advance-deposit ratio lie between 0.11-0.14 and significant at 1% level of significant which imply that if advance-deposit ratio increase 1unit ROA increase by 0.14 unit. Estimated result also demonstrate that in all model (2-6) the coefficient of NPL is significant and vary between -0.07 to -0.08. That is if NPL increases by 1unit ROA decrease by 0.08 unit. On the other hand, ROA elasticity with respect to call money rates range between -0.05 to -0.09 which indicate that

if call money rates increase 1 percentage point banks' profit decrease by 0.08 unit which implies higher call money rate indicates higher demand from interbank borrowing show a sign of lower profit as well as liquidity stress in the banking industry. The coefficient of excess liquidity ratio is -0.06 with expected sign. This denotes that if excess liquidity increase by 1 unit, profit decrease by 0.06 unit. So, there is a trade-off between bank liquidity and profitability. Breusch-Pagan-Godfrey test shows that there is no hetroskedasticity in the residuals of all estimated equations (1-6 model). It implies that estimated results are robust.

Section VII: Conclusion

The main objectives of the paper were to examine the relationship between liquidity and profitability , and the impact of liquidity on banks' profitability. The paper uses Ordinary Least Square estimation method (OLS) method for the sample period 1997-2014. The analysis of estimated results show that the high ratio of advance-deposit indicates the lower liquidity and higher profit. However, too low ADR indicate inefficiency of the banks to use the funds, or simply a lack of profitable investment opportunities.

The call money rates varies negatively with banks' profit which indicates that banks meet their liquidity deficit with higher cost. As a results, higher cost of funds impact banks profit inversely. Accordingly, the estimated result shows a negative relation between NPL and profitability. So commercial banks need to be careful while giving loan and reduce NPL to increase profitability.

The recent rising in NPL is concerned for overall banking stability because high NPL gives huge stress in the banks to earn profit. It is observed (Annexure Table-4) that the percentage share of NPL to total loans has reduced dramatically from 1997 to 2011. The gross NPL ratio for all banks declined to 6.20 percent in 2011 from the peak 37.5 percent in 1997. The ratio again increased during the previous two years due to sharp increase in NPL of SCBs.

Based on the above analysis we can conclude that there exist a negative relationship between liquidity and profitability. So banks authority should focus more on liquidity management for the bank's profitability. Moreover, careful consideration and planning of liquidity management is needed to improve efficiency of liquidity management. In addition, commercial banks should not solely concentrate on the profit maximization but should also adopt measures how to achieve the optimal liquidity level.

It mentioned that BB has introduced an 'Integrated Supervision System (ISS), through launching a software in October 2013, with an aim to facilitate quicker financial analysis of all aspects of banking activity, especially to lower the risk of fraud and forgery in the country's banking sector. BB also strengthened the monitoring and supervision strategies for the four state-owned commercial banks (The Sonali Bank Ltd., the Janata bank Ltd., the Agrani Bank ltd.and the Rupali bank ltd.) to improve their financial health. To this end, BB revised and signed fresh memoranda of understandings (MoU) in 2013. Moreover, a fresh MoU was signed with a government owned specialized bank (The Basic Bank Ltd) to improve its governance in 2013.

However, the analysis of the relationship between liquidity and profitability is in an aggregate level data of banking industry with small sample size which is a major limitation of the paper. Further research is left for future on the same area by using a wider disaggregate level data.

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Annexure

Table-1 Sources of Demand and Supply for Liquidity within the Bank

Supplies of Liquid Funds Come From:	Demands for Bank Liquidity Typically Arise From:
Incoming customer deposits	Customer deposit withdrawals
Revenues from the sale of nondeposit services	Credit requests from quality loan customers
Customer loan repayments	Repayment of nondeposit borrowings
Sales of bank assets	Operating expenses and taxes incurred in producing and selling services
Borrowing from the money market	Payment of stockholder cash dividends

Source: Commercial Bank Management, Peter S. Rose, 2002.

Table-2 Movements in Interest Rate Spread

Period	SCBs	DFIs	PCBs	FCBs
2001	6.03	5.06	7.55	8.23
2002	6.15	5.92	7.05	7.4
2003	5.77	4.71	6.55	7.32
2004	4.87	3.7	5.54	7.45
2005	5.41	3.66	5.07	7.87
2006	5.63	3.18	5.44	8.12
2007	5.95	2.95	5.7	8.83
2008	3.96	3.12	4.7	9.33
2009	3.47	2.7	5.29	9.26
2010	4.18	2.26	5.38	8.82
2011	5.01	2.16	5.37	8.89
2012	4.06	2.73	5.51	8.76
2013	3.66	3.06	5.34	8.59
2014	3.71	1.68	5.94	7.92

Source: Scheduled Banks Statistics, Statistics Department, BB.

Table-3 Banking sector aggregate balance sheet in Bangladesh (in billion Tk)

Particulars					Change (%)	
	2011	2012	2013	2014	2012 to 2013	2013 to 2014
Property & Assets						
Cash in hand (including FC)	59.7	81.1	102.7	91.1	26.7%	-11.33%
Balance with BB & SB (including FC)	399.5	450.8	479.3	572.8	6.3%	19.5%
Balance with other banks &FIs	155.9	244.7	347.9	409.7	42.2%	17.8%
Money at call & short notice	128.1	66.8	46.5	54.2	-30.4%	16.4%
Investments						
Government	662.1	607.6	841.2	977.6	38.5%	16.2%
Others	131.3	505.9	730.0	855.5	44.3%	17.2%
Total Investment	793.4	1113.5	1571.2	1833.1	41.1%	16.7%
Loans & advances						
Loans, CC, OD ect.	3525.1	4098.4	4443.5	5147.2	8.4%	15.8%
Bills purchased & Disct.	267.5	288.2	276.6	245.7	-4.0%	-11.2%
Total Loans & advances	**3792.5**	**4386.7**	**4720.1**	**5392.9**	**7.6%**	**14.3%**
Fixed assets	143.7	162.1	198.2	216.7	22.3%	9.4%
Other assets	401.1	488.1	532.5	570.7	9.1%	7.2%
Non-banking assets	1.2	36.9	1.7	1.9	-95.4%	11.6%
Total Assets	**5874.9**	**7030.7**	**8000.2**	**9143.0**	**13.8%**	**14.3%**
Liabilities						
Borrowings from other banks/FIs/ Agents	226.3	316.0	221.6	313.0	-29.9%	41.3%
Deposits &Other Accounts						
Current Deposit	992.9	989.6	1091.0	1295.3	10.3%	18.7%
Savings Deposits	933.7	972.6	1047.7	1225.6	7.7%	17.0%
Fixed/Term Deposit	2583.2	2985.6	3622.3	3931.1	21.3%	8.5%
Other Deposits	-	474.4	533.3	688.6	12.4%	29.1%
Total Deposits	**4509.8**	**5422.2**	**6294.3**	**7140.6**	**16.1%**	**13.4%**
Bill payable	65.3	76.0	68.9	87.8	-9.3%	27.5%
Other liabilities	546.4	640.6	737.2	860.2	15.1%	16.7%
Total Liabilities	**5347.8**	**6454.7**	**7321.9**	**8401.7**	**13.4%**	**14.7%**
Capital /Shareholders' equity	527.1	575.9	678.3	741.3	17.8%	9.3%
Total liabilities & Shareholders' Equity	**5874.9**	**7030.7**	**8000.2**	**9143.0**	**13.8%**	**14.3%**
Off-balance sheet items	1814.6	1871.3	2153.1	2360.95	15.1%	9.7%

Source: FSR, BB, 2014.

Table-4 NPLs (%) of the Banking Sector by types of Banks

Types of Banks	1997	2000	2003	2006	2009	2010	2011	2012	2013	2014
SCBs	36.57	38.56	29	22.9	21.4	15.7	11.3	23.9	19.8	22.2
DFIs	65.72	62.56	47.4	33.7	25.9	24.2	24.6	26.8	26.8	32.1
PCBs	31.42	22.01	12.4	5.5	3.9	3.2	3	4.6	4.5	5.0
FCBs	3.58	3.38	2.7	0.8	2.3	3	3	3.5	5.5	7.3
Total	37.5	34.9	22.1	13.2	9.2	7.1	6.2	10	8.9	9.7

Note: NPLs= gross nonperforming loans to total loans

Source: Annual Report, BB.

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The Relation between Financial Development and Economic Growth: An Econometric Analysis of Macro and Macroprudential Indicators in Emerging Economies

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Abstract

Over the last few decades researchers have reached in a consensus that financial development, in its form of bank credit relative to GDP, has a strong positive relationship with economic growth. However, financial innovations in the globalized economy have changed the situation gradually and made the relationship inconclusive. In this paper, we re-examine the relationship between financial development and economic growth over 23 emerging economies and estimate that in some points 'excessive finance' can be happened. Our cross-country panel regression using GMM model suggests that financial development no longer has a positive effect on economic growth when the credit to the private sector reaches about 165 percent of GDP. When we consider for non-linearity, we find an inverted U-shaped relationship between finance and growth. Moreover, we also introduce the credit-to-GDP gap (i.e. deviation of credit gap from its long term trend) as one of the control variables and find that the credit-to-GDP gap beyond 2 percent of GDP has a significant negative relationship with real economic growth. Finally, we suggest macroprudential policies are to be designed to limit the procyclicality in the economy without affecting the real growth.

Keywords: Panel Data Model, Instrumental Variables (IV) Estimation, Business Cycles/ Fluctuations, Financial Development, Economic Growth, Empirical Studies of Economic Growth, Financial Crises.

JEL Classification: C23, C26, E32, O16, O00, O4

Introduction

Over the last few decades researchers have reached in a consensus that financial development, either in its form of bank credit relative to GDP or monetary aggregates in terms of GDP, has a strong positive relation with economic growth. However, financial innovations in the globalized economy have changed the situation gradually and made this role inconclusive. The changing scenario is that financial development helps achieve higher

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economic growth but excessive finance without increasing the GDP (in proportionate term) may not increase the economic growth.

During the emerging stage of the economy, credit growth is helpful to achieve higher economic growth. This is because, private entrepreneurs can get their fund they need to expand their business; households can have a secured place for their money, making them more willing to provide finance to the corporate sector through the banks and so on.

There are excellent number of researches where it is found that financial development boosts economic growth. A study on South Asian countries revealed that output growth could be increased from current level to a higher level by substantially increasing the investment share to GDP (Ahmed 2007).

Financial development plays an essential role in promoting economic development. In pursuits of a causal relationship between financial development, King and Levine (1993) found that financial development stood as a predictor of economic growth. On the other hand, a time series analysis on 16 countries found no evidence of a causal relationship between finance and growth (Demetriades 1996).

Researchers have also found a steady state relationship between private credit and GDP in a particular economy such as Ireland (Robert K. 2013).They found that growth rates of GDP and private credit appeared as highly correlated suggesting the possibility of a long-run equilibrium relationship. In their works, they also have examined the possible scenario of expansion of credit that could be linked to that of deposits but did not find such a link in case of Irish economy, although it is assumed that there might have been significant benefits of having such a link.

Some economists have overemphasized the role of finance on economic development (Rodrick 2009). On the other hand, an empirical study on 75 countries over the period 1960-2000, using the panel error correction model and allowing for heterogeneity in parameters in growth regressions accounted for the contrasting effects based on the distinction between the short and long-run effects of financial intermediation (Loyaza 2006).They also found the long run positive relationship between financial development and growth while short run impact remained significant but negative. Finally, they suggested that short run impact might be due to cross-country heterogeneity in general and higher volatility of business cycles in particular.

A group of ESRB's (European Systemic Risk Board) Advisory Scientific Committee conducted a research in 2014 to answer the question whether has banking system grown too much in Europe. They found that over the past 15 years, the European Union's banking sector has undergone radical transformation, in the form of ballooned size with more leveraged. They also have suspected about inadequate prudential supervision, politics, technology and competition for the overbanking situation that the combined scenario could be a potential threat for banking crisis (European Systemic Risk Board 2014).

However, another empirical research has shown that excessive credit (in terms of GDP)

is detrimental to aggregate productivity growth and per worker income growth. (Stephen G Cecchetti and Enisse Kharroubi 2012). Moreover, a rapid increase in credit could be a leading cause of distress in a particular economy when a significant portion of credit is grasped by moral hazard and to unproductive and concentrated sector. Researchers have found a link between credit booms and financial crises and regarded excessive credit an 'Early Warning Indicator' for systemic crisis. Empirics also have suggested that excessive credit growth tends to experience more severe financial crises, which in turn are associated with deeper recessions (Rogoff 2011).

In this paper, we have re-examined the relationship between financial development and economic growth for 23 emerging economies and endeavored to find out whether there is a threshold above which financial development no longer has a positive effect on economic growth. We have quantified the financial development by using the credit to the private sector extended by deposit money banks and other financial institutions, in terms of GDP. Considering the pros and cons of using this variable as a metric of financial development, we have chosen it due to its availability for a large cross-section of countries. We have followed Jean-Louis Arcand, Enrico Berkes and Ugo Panizza (2012) to estimate whether too much finance is good for economic growth. They found not only a positive and robust correlation between financial depth and economic growth in countries with small and intermediate financial sectors but also obtained a threshold level of financial development above which finance started having a negative effect on economic growth (Arcand JL., Too Much Finance? 2012).

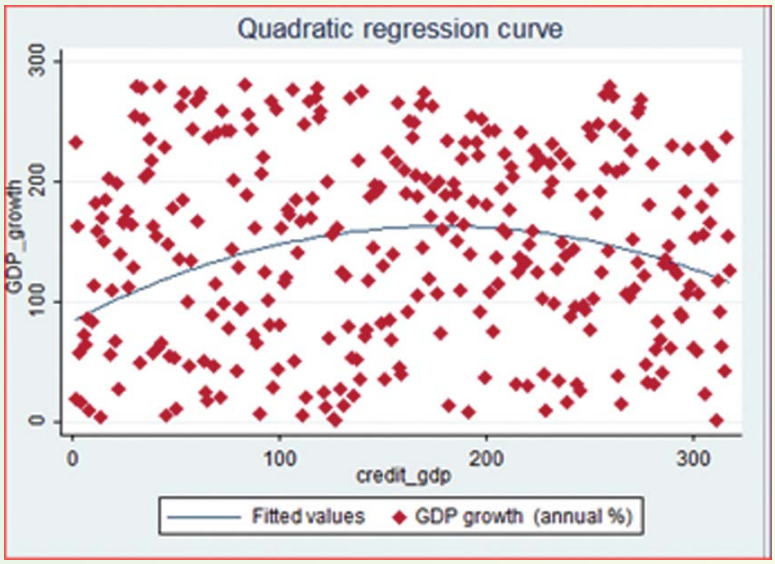
Finally, as an addition to growth regression, we have brought into light the necessity of adopting the macroprudential tools that could be activated in the period of economic boom and deactivated in the period of recession. Such policy tool could mitigate the procyclicality and ensure a sustainable economic growth.

Data Description

We have started our research by assuming the relationship between the financial development and economic growth to see whether there is a point where larger is no longer better. We have chosen the variable namely the credit-to-GDP as the main explanatory variable that captures the 'credit to the private sector extended by deposit money banks and other financial institutions, in terms of GDP' as a proxy of financial development. The dependent variable is real economic growth. Description of the dataset has been shown in table 3.

Scatter plotting of the fitted values in the quadratic regression is shown below.

Figure 1: Scatter plotting of the Quadratic regression curve between credit-to-GDP and GDP growth (authors' drawing by using STATA).



Cross-country OLS Regression

We have studied a large number of literatures that have shown the presence of a causal positive relationship between financial development and economic growth except a few that have found no relationship between them. In some of the studies, the authors have used the log of financial development and therefore assuming a non-linear relationship between financial development and economic growth. However, apart from their works, we also have checked the higher polynomial terms to investigate the non-monotonic relationship between financial development and economic growth.

We have quantified the financial development by using the credit to the private sector extended by banks and other financial institutions in terms of GDP, referred to as credit-to-GDP. Considering the pros and cons of using this variable as a metric of financial development, we have chosen it as a proxy of financial development due to its availability for a large cross-section of countries.

We have initiated our cross country analysis following the paper titled "Stock Markets, Banks and Growth: Panel Evidence" prepared by (Beck 2004). In our model, we have regressed GDP growth with credit-to-GDP ratio and square of credit-to-GDP ratio. We assumed the endogeneity problems in the cross-sectional data, therefore, we thought simple OLS was the most transparent way to look at the data at the first stage. Afterward, we also have used the higher polynomial such as cubic value of the credit-to-GDP ratio.

As anticipated, we have found that credit-to-GDP ratio has a positive and significant relationship with GDP growth whereas the squared value of this ratio has produced significantly negative co-efficient that signaled for the non-monotonic relationship with the dependent and explanatory variable. When we added the cubic value of the same ratio, it yielded again the positive coefficient. What we have obtained, economic cycle has a non-monotonic relationship with credit-to-GDP ratio; i.e. financial development. The following table (Table:1) shows the cross-country OLS regression.

Table 1 : OLS Estimation (Different Models)

Dependent Variable: GDP Growth (GDP_GR)	**Model (1)**	**Model (2)**	**Model (3)**
Credit to GDP (C_G)	0.875*** (0.163)	0.943*** (0.168)	1.944*** (0.444)
Lagged value Credit to GDP (L.C_G)		-0.115 (0.072)	-0.030 (0.076)
Credit to GDP Square $(C\_G)^2$	-0.002*** (0.001)	-0.002*** (0.001)	-0.010*** (0.004)
Cubic value of Credit to GDP $(C\_G)^3$			0.00002** (0.00001)
Intercept ($\alpha_{0)}$	84.265 (10.460)	88.534 (12.622)	-58.93 (17.026)
No of Observations	345	322	322
R^2	0.085	0.109	0.113

Cross-country Panel Regression

Our main assumption was that credit to the private sector was a catalyst to output growth but excessive or too much of it might not hold the same relationship. Utilizing the Generalized method of Moments (GMM) model, our panel estimation has yielded that credit-to-GDP ratio affects the GDP growth positively until reaches its optimum level (i.e. the threshold); however, if it is exceeded from the optimum, the ratio affects the growth negatively. As is standard in the literature on financial development and economic growth, our regressions include the following control variables: inflation, government expenditure as a percentage of GDP, and savings as a percentage of GDP.

The equation for panel estimation is as follows:

$$GDP\_GR_{i,t} = \alpha_0 + \beta_0 C\_G_{i,t} + \beta_1 (C\_G_{i,t})^2 + \beta_2 C\_G\_GAP_{i,t} + \beta_3 Savings_{i,t} + \beta_4 INF_{i,t} + \beta_5 GOV\_EX_{i,t} + \beta_7 LEV_{i,t} + \square_{i,t}.$$

Here, the GDP_GR stands for GDP growth, C_G for Private Credit-to-GDP, $(C\_G)^2$ for squared value of Private Credit-to-GDP, Savings for savings as a percentage of GDP, INF

for Inflation rate, GOV_EX for government expenditure as a percentage of GDP and LEV for leverage (i.e. Loan-to-Asset Ratio) of the banking sector. We have used the leverage (LEV) as an instrumental variable for growth regression.

The rationale behind using the GMM model is due to larger cross section (N=23 countries) and shorter time span (T=15 years), GMM estimators are likely to produce

better estimations than fixed effect model because the panel dataset have suffered from cross-sectional dependence and serial correlation. Moreover, due to causal relationship, some of our variables have endogeneity problem; it was very difficult to say which the direction of the causal relationship; i.e. credit -to-GDP affects GDP growth or higher GDP growth stimulate the economy to expand more credit that could be translated to higher economic growth. Keeping into account these obstacles, we have used the GMM model with instrumental variable regression and obtained the better results. The Sargan test of over-identification restriction also confirms the robust estimation.

GMM estimation has been used to run the regressions as Ordinary Least Square (OLS) method could be biased due to cross-sectional interdependence. Lagged value of loan-to-asset ratio has been chosen as an instrument variable. To have a robust estimation, different control variables have been used in the robust GMM regressions such as savings as a percentage of GDP, Inflation, and government expenditure as a percentage GDP. The result of AR1 and AR2 also certifies the robustness of the used models.

The following table (Table: 2) represents the results of a series of panel regressions (GMM Estimation). Our main objective is to explore the effect of the private credit on GDP growth and to find out a threshold above which the ratio does not translate into higher economic growth. To do this, the squared figures of the variable (credit-to-GDP)^2 has been used to estimate the quadratic fit of the model.

Table: 2: GMM Estimation

Dependent Variable: GDP Growth (GDP_GR)	**Model (1)**	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**	**Model (6)**
Credit to GDP (C_G)	1.643*** (0.334)	1.735*** (0.340)	1.403*** (0.304)	1.282*** (0.422)	1.578*** (0.391)	1.429*** (0.340)
Credit to GDP Square $(C\_G)^2$	-0.005*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.004** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)
Lagged value of Loan to Asset Ratio (LEV) (as an instrument)	0.258 (0.356)	0.278 (0.355)	-0.204 (0.408)	0.334 (0.420)	0.098 (0.385)	-0.215 (0.371)
Credit to GDP Gap (C_G_GAP)		-17.332** (7.433)				-18.573*** (6.330)

Savings-to-GDP (Savings)			-8.314** (3.105)			5.622** (2.234)
Inflation (INF)					-2.555** (0.947)	-2.934*** (0.896)
Govt. Expenditure-to-GDP (GOV_EX)				-4.085 (3.511)		
Intercept ($\alpha_{0)}$	27.374 (21.761)	26.890 (21.610)	-129.290 64.273	146.012 (102.955)	57.608 (30.662)	42.732 (60.961)
No of Observations	273	273	273	270	272	272
AR1 P Value	-3.05 0.002	-3.05 0.002	-3.12 0.41	-3.01 0.003	-3.09 0.002	-3.14 0.002
AR2 P Value	-0.68 0.495	-0.83 0.406	-0.41 0.685	-0.81 0.417	-0.58 0.563	-0.61 0.541
dGDP_GR/ dC_G	164.33	173.5	175.38	160.25	157.8	178.63

Our estimation supports the hypothesis 'excessive finance' is not good for economic growth. It confirms that the marginal effect of financial development is positive up to certain threshold point but the marginal impact of financial development is significantly negative after that point. Moreover, credit-to-GDP gap or credit gap also affects the GDP growth negatively. It means if an economy's credit gap rises at a higher level than its trend, it would create the boom and collude the economic growth.

Robustness Checks

Semi-parametric Estimation and Quadratic Estimation

To check the robustness of our estimation result, we have used the semi-parametric estimator in our cross-country regression. We took the credit-to-GDP as its normal form, then we have found the relationship between credit-to-GDP and GDP growth was concave and mono tone (credit-to-GDP) had a positive and significant coefficient while the lagged value of the ratio produced a negative coefficient. At higher level of financial development, the ratio yielded significant negative coefficient.

When plotted the estimated result in the graph, we have found a curvature that looked like non-linear. To prove this, we have used the square of the credit-to-GDP ratio in the estimation and found a negative relationship with the GDP growth. We have calculated the first differentiation and found a threshold above which credit-to-GDP ratio had no longer positive relationship with GDP growth.

(Rioja 2004) found an S-shaped relationship between financial development and economic growth that could be better explained by incorporating a cubic polynomial in the regression

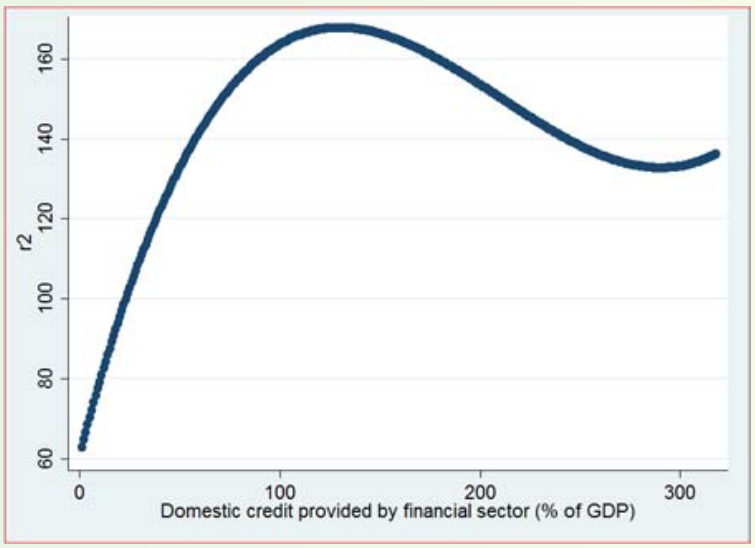
equation. To reveal the true nature of the non-linearity in the relationship between financial development and economic growth, we have estimated a set of semi-parametric estimation that allows financial development taking unrestricted functional form including quadratic and polynomial regressors.

To estimate the relevant semi-parametric equation, we have used 1 year-lagged value of credit-to-GDP ratio along with current year's credit-to-GDP ratio, squared value of credit-to-GDP ratio and cubic value of the same ratio to see whether the relationship between credit-to-GDP ratio and GDP growth is non-monotone and concave. Otherwise, if we had only regressed the equation by using the credit-to-GDP ratio, we might be ended with a spurious regression.

We have found that lagged value of credit-to-GDP ratio has a negative coefficient with economic growth, where the current years' credit-to-GDP ratio has a positive coefficient. Squared value of the credit-to-GDP ratio produces negative coefficient whereas the cubic value yields positive coefficient. It seems logical to conclude that likewise other business cycle theory, GDP growth also has a cyclical pattern and it has a non-linear relationship with credit-to-GDP ratio. The semi-parametric estimation has spotlighted the threshold value of credit-to-GDP around 165 percent of GDP. This threshold is quite similar to the one obtained with the quadratic model.

The following figure illustrates the result of semi-parametric estimation.

Figure 2: Semi parametric growth estimation (graph drawn using STATA)

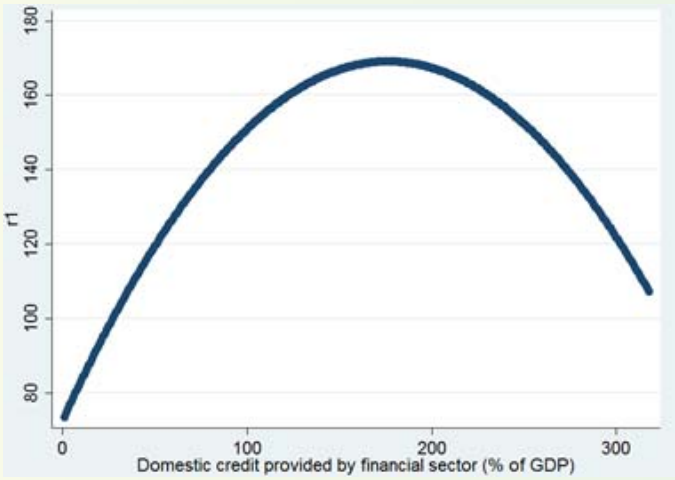


It seems to appear from the above analyses (i.e. both the semi-parametric and quadratic regressions) that there is a non-monotonic, concave relationship between the credit-to-GDP ratio and economic growth. As mentioned above, a quadratic estimation can serve our purpose of estimating the true relationship between them.

Inverted U-shape Relationship between Financial Development and Economic Growth

An inverted U-shape could be existent due to compositional effects, for example, bank-based financial systems and the market based financial systems; both could contribute to form the parabola. We have used the credit to the private sector, as a percentage of GDP, assuming that it could capture the compositional effect of financial development. Following Graph plots the relationship of credit to GDP (explanatory variable) on economic growth and the quadratic fit of the explanatory variable.

Figure 3: Relationship between the Credit-to-GDP ratio and Economic Growth.



If we look at the parabola (Figure:3), we can infer the threshold value of the credit-to-GDP ratio, above which the ratio no longer has a positive effect on economic growth. After estimation, we have made the first differentiation to obtain the threshold value that is, a threshold value of 164 percent of GDP. Many countries are close to beyond this level, suggesting that more financial deepening will not achieve higher economic growth. For example, during the financial crisis, some countries exceeded the threshold limit; for example, in South Africa, private credit of banks crossed 200 percent of GDP at the onset of crisis whereas in Thailand the ratio reached 169 percent during that time. By contrast, in two countries like India and Bangladesh, where financial development are less than 70 percent, can still yield significant benefits from further financial development. Overall, all the countries have been selected from emerging economies and therefore have been attributed to higher economic growth linked with relatively higher ratio of financial development but still it has a limit that has been discussed above.

To confirm our finding of an inverted U shaped relationship, we have conducted the U test of (Lind J.T. 2010). The rationale behind this test is that conventional econometric model is not suitable for testing the composite null hypothesis that at the left side of the interval the relationship is decreasing, and at right side of the interval the relationship is increasing, or

vice-versa. Moreover, if the model does not allow non-monotonocity, it may lead to a downward bias in the estimating effect of financial development on economic growth.

The following table (table: 3) shows the results of Sasabuchi-Lind-Mehlum test for inverse U-shaped relationship. The table represents the results based on the variables of GMM estimations as mentioned in table: 1.

Table 3: Tests for an inverted U-shape relationship

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Slope at PC min	0.0091***	0.0080***	0.01040***	0.0072***	0.0085***	0.0101***
Slope at PC max	-0.0069***	-0.0062***	0.0068***	-0.0049***	-0.0065***	-0.0067***
P-value	0.0002	0.0002	0.0001	0.0044	0.0001	0.0002
Fieller 90 percent confidence level	[161.61; 211.08]	[161.86; 211.53]	[173.92; 222.73]	[167.20; 248.17]	[162.83; 207.65]	[174.97; 218.23]

***p≤0.01, ** p≤0.05, *p≤0.1

Macroprudential Perspectives of Excessive Financing

We have also shown the effect of credit-to-GDP gap on economic growth. The gap typically means the deviation of credit-to-GDP gap from its long term trend using the Hodrick Prescott Filter (HP filter). In this stage, we have used the financial cycle as a control variable that strategically takes as the dummy variable indicating the 'Credit-to-GDP gap. The gap captures actually not the business cycle but the financial cycle that signals the boom and bust cycles of the economy. Thus our motivation to include this variable in the regression model has been driven from the perspective of systemic risk and procyclicality of the economy. Borio and Lowe first recognized its property as a very useful early warning indicator (EWI) for banking crises (Borio 2002).

When the credit-to-GDP Gap persistently rises above 2 percent for several years, it signals about the initiation of the boom cycle, so, we have used 1 for it; otherwise (for the gap<2), we have used the dummy as 0. We have found that credit-to-GDP gap moves countercyclically with the GDP growth. Robust estimations using model no. 2 and 6 in the table: 1illustrates the significant and negative relationship between the variables.

Statistically, the correlation between the credit-to-GDP gap and real GDP growth is negative across a panel of 23 countries over the period of 2000 to 2014 but small in size. The dummy (1) predicts about the periods of excessive credit growth that are not persistent with GDP growth. The credit-to-GDP gap is an indicator for building up excessive leverage and systemic risk in the banking system, thus indicating the activation

time of the macroprudential tools such as the countercyclical capital buffer for limiting the procyclicality. Many jurisdictions, for instance, the Bank of England, Swiss National Bank, the Central Bank of Norway and Reserve Bank of India etc. are monitoring a small number of indicators in addition to the credit-to-GDP gap in evaluating aggregate vulnerabilities and making decision about the activation of the countercyclical capital buffer.

Policy Recommendations

In this paper, an effort has been made to find out a threshold of financing or financial development among 23 emerging countries above which the value could be treated as 'too much' since too much financing would not yield better outcome anymore. But due to heterogeneity of the countries, the threshold might not hold perfect for each particular country. As we have seen excessive finance is not always good for any particular economy since the marginal benefit could decline after crossing the threshold. Although each country may have differentiated level of threshold, some commonalities exist among them. For example, the credit-to-GDP gap exceeding 2 percent would perhaps create systemic risk and vulnerabilities regardless of the country. Our estimation results supports the macroprudential policies based on the threshold of the credit-to-GDP ratio and credit-to-GDP gap in each particular economy in consideration with other macroeconomic variables.

Although regional and global collective initiatives do have their roles in addressing stability concerns, but the primary obligation for maintaining macroeconomic and financial stability should begin and remain at the country level. For maintaining a balanced and stable macroeconomic environment, the relevant authorities should implement the justified macroprudential policies such as the countercyclical capital buffer when the economy starts to experience booming. However, empirics did not find any link between higher capital requirement and economic growth but from the perspective of risk management, higher capital requirement would shield the financial intermediaries from the potential risks arisen due to possible future downturn of the economy.

Policymakers should have to use a great deal of discretion in implementing the macroprudential policy. The short-run dynamic impact of a temporary change in capital requirements should be studied extensively. The most critical concern is that policy lags could create unintended consequences as well as worsen the downturn if a temporary increase in the capital buffer occurs at a wrong time such as the moment when the bubble is bursting.

It seems logical to conclude that the relationship between the financial development and economic growth could depend upon the manner through which finance is provided. If the finance is provided in productive assets, it would certainly less riskier than investing in speculative business or consumer goods. Therefore, a good mix of macroprudential tools could be applied to reduce the risk of financial intermediaries and the economy as a whole.

Conclusion

In this paper, we have re-examined not only the relationship between financial development and economic growth but also pointed out the situation when the financing appears as 'excessive'. At the end, we have come to two basic conclusions. First, the relationship between financial development and economic growth is non-monotonic and they exhibit an inverted-U shape relationship. We have estimated the threshold level of financial development as 165 percent of GDP above which further enlargement of the financial system could yield declining real economic growth. Second, the successive deviations of the credit-to-GDP ratio from its long term trend (i.e.credit-to-GDP gap) have a negative impact on the real economic growth. Moreover, the credit-to-GDP gap seems to produce a useful decision-making input for macroprudential policymakers. Likewise, Basel Committee on Banking Supervision (Basel Committee on Banking Supervision 2010) has brought into light the credit-to-GDP gap as an Early Warning Indicator (EWI) for systemic banking crises, we have re-examined the suitability of this indicator in the cross-country growth regression and found a conclusive negative relationship with the real economic growth.

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Table 4: Data Description and Sources

Variable	Variable's short name	Description	Sources
GDP Growth	G_GR	Annual percentage growth rate of GDP at market prices based on constant local currency.	World Bank Data
Credit to GDP	C_G	Claims on private sector by deposit money banks and other financial institutions divided by GDP. It includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net.	World Bank Data
Loan to Asset Ratio	LEV	Bank loan is a type of debt. Like all debt instruments, a loan entails the redistribution of financial assets over time between the lender and the borrower.	HelgiLibrary Data
Savings-to-GDP	Savings	Expressed as a ratio of gross national savings in current local currency and GDP in current local currency.	IMF Data
Inflation	INF	Annual percentages of end of period consumer prices are year-on-year changes.	IMF Data
Govt. Expenditure-to-GDP	GOV_EX	Total expenditure consists of total expense and the net acquisition of nonfinancial assets.	IMF Data

Table: 5: Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
GDP Growth	Overall	5.112	3.881	-14.8	33.74	N = 322
	Between		1.764	2.33	9.856	n = 23
	Within		*3.476*	-13.879	30.874	T = 14
Credit to GDP	Overall	68.047	44.548	4.91	201.58	N = 321
	Between		43.226	18.724	181.324	n = 23
	Within		13.709	23.040	115.130	T = 14
Savings-to-GDP)	Overall	24.407	8.142	10.01	53.03	N = 345
	Between		7.541	14.981	46.941	n = 23
	Within		3.427	8.276	35.600	T = 15
Inflation	Overall	7.796	7.674	-1.77	62.17	N = 342
	Between		5.353	2.252	25.862	n = 23
	Within		5.585	-5.536	44.711	T = 15
Govt. Expenditure-to-GDP	Overall	25.936	7.833	11.408	49.15	N = 339
	Between		7.415	12.806	42.789	n = 23
	Within		2.990	18.474	44.574	T = 15
Loan to Asset Ratio	Overall	51.269	19.254	4.7	122.4	N = 374
	Between		18.355	5.645	98.131	n = 23
	Within		6.8510	44.323	73.934	T = 15

Table: 6: List of Countries

Serial No.	Name of the Country	Serial No.	Name of the Country
1	Argentina	13	Nigeria
2	Bangladesh	14	Pakistan
3	Brazil	15	Peru
4	Chile	16	Philippines
5	China	17	South Africa
6	Colombia	18	Sri Lanka
7	Egypt, Arab Rep.	19	Thailand
8	India	20	Turkey
9	Indonesia	21	Venezuela, RB
10	Kazakhstan	22	Vietnam
11	Malaysia	23	Ukraine
12	Mexico		

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The Competitiveness of Banking Industry in Bangladesh : An application of Conjectural Variation (CV) Approach.

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Abstract

Stability in the financial market is largely influenced by its market structure. The efficiency of the production of financial services, the quality of the financial products as well as the degree of innovation of financial products is also influenced by the degree of competition in the financial sector. Moreover, the degree of competition in financial sector or banking sector in specific, determines the accessibility of firms and households to the extent of financial services and external financing.

Using a panel data framework of 36 banks for 10 years (2001-2013) and applying a non-structural Conjectural Variation (CV) approach, the empirical investigation finds that the overall banking industry in Bangladesh is in a state of monopolistic competition. Segregating the whole sample into two samples based on the ownership structure of banks, the paper finds that the private commercial banks (PCBs) are more competitive than the government owned commercial banks (SCBs) and also reveals that more market power is exercised by the PCBs (28.5) than the SCBs (3.79%).

The results reveal that banks in Bangladesh could have taken relationship lending/banking strategies and might have ensure stability in the financial market protecting themselves encountered from the lemon market. The findings also may help the regulators whether to increase competition in the banking industry by allowing more banks, but with the fortune of "winner's curse".

Keywords: Competition, Banking, Conjectural Variation

JEL Classification: E-44, G-21, L-10

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1. Introduction

From the early 1990s, the financial sector of Bangladesh has undergone a lot of reform measures: deregulation of administered interest rate regime, moving out subsidies from the banking system to the budget etc. Allowing more commercial banks under private ownerships and deepening of the financial system through the participation of broad based non-bank financial institutions are also remarkable events in the financial systems of Bangladesh in the last two decades. Considering the past and recent banking sector performance and the both inside & outside competitive environment, the present paper identifies the degree of competition with market power among the banks.

Stability in the financial market is largely influenced by its market structure. The efficiency of the production of financial services, the quality of the financial products as well as the degree of innovation of financial products is also influenced by the degree of competition in the financial sector (Claessens & Laeven, 2004). Moreover, the degree of competition in financial sector or banking sector in specific determines the accessibility of firms and households to the extent of financial services and external financing.

The empirical investigation through a non-structural conjectural variation approach finds that the overall banking market in Bangladesh is in a state of monopolistic competition and the PCBs are more competitive than the SCBs. The empirical result of conjectural variation approach also indicates that the PCBs enjoy a greater market power (28.5%) than the SCBs (3.79%).

The competition in the banking system is also crucial for Bangladesh. It is important for the policy makers and regulators while licensing more banks as well as bank branches, whether the existing industry is sufficiently producing financial assets with efficiency or not. For example, if the industry is already in a state of sufficient competition, it might be vulnerable for the industry if regulators allow more banks. This is because; more competitors will force more risk taking behavior by banks and thus, may cause a bank run. As such, the study of the competitive conduct in the banking industry of Bangladesh in a more logical and empirical way is desirable.

The rest of the paper is organized as follows. Section-2 gives a brief on the important characteristics of the banking industry of Bangladesh. Section -3 provides the theoretical approaches for measurement of competition along with the review of relevant literatures. Section-4 provides the empirical approach and data sources; while Section-5 measures the level of competition in the banking industry using the empirical approach and discussions. Finally, this paper ends with conclusion and recommendations in Section-6.

2. Financial System of Bangladesh: An Overview

The financial system of Bangladesh at present, like many other developing and developed nations, is comprised of scheduled commercial banks, non-bank financial institution (NBFIs), microfinance institutions (MFIs), various co-operative banks, insurance companies, capital markets, securities companies and stock exchanges.

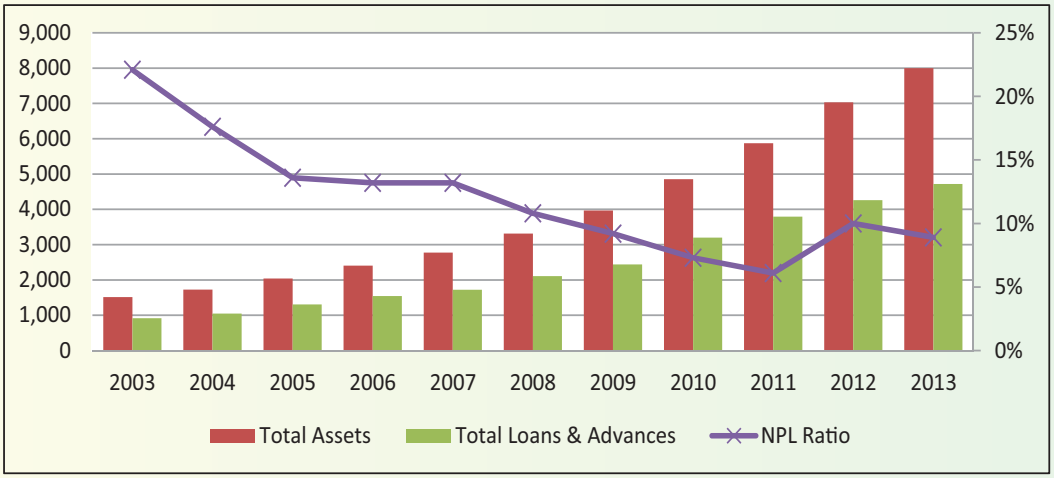
The financial system of Bangladesh is largely dominated by the banking sector. According to Goldsmith (1969), McKinnon (1973) and Shaw (1973) the financial deepening and the economic development of a country is closely related. Though Bangladesh's financial system has a wide array of other financial institutions of 62 insurance companies (44 general & 18 life), 31 NBFIs, 54 merchant banks, Bangladesh House Building Finance Corporation, Investment Corporation of Bangladesh and 599 registered MFIs beside the formal banking sector[1], their share is still insignificant. One way to justify this argument is to look at the contribution of financial intermediaries to national GDP. The sectoral share of financial intermediaries to GDP at constant prices in FY 2012 was 2.1%; out of which the banking sector alone contributes by 1.54% (Bangladesh Economic Review, 2014). The NBFIs role is assumed to be marginal and have only 1% of total financial system assets (Bahar, 2009). Thus, Bangladesh still has an underdeveloped financial system characterized by poor financial intermediation wherein the banking sector is dominating with a limited role of NBFIs (Bahar, 2009).

In terms of ownership structure the banking sector of Bangladesh is sub-grouped into state owned, privately owned and foreign owned banks. As of December 2013, the banking sector of Bangladesh is comprised of: (a) Bangladesh Bank as the central bank, (b) 56 commercial banks, including 4 state owned commercial banks (SCBs), 39 domestic private commercial banks (PCBs), 9 foreign commercial banks (FCBs) , and 4 state owned specialized banks (DFIs). Of that, 6 domestic private banks and 1 foreign bank are operating under Islamic Shariah.

By the end of December 2013, the total banking sector assets of Bangladesh was Taka 8000.2 billion; of that, the share of loans and advances to total assets was 58.98% amounted to Taka 4718.2 billion. However, a significant portion (8.9% in 2013) of this interest earning assets is characterized as non-performing. A favorable aspect is that the financial sector of Bangladesh has experienced a positive trend in reducing the portion of non-performing assets during the last decades. The ratio of non-performing loans (NPLs) to total loans has declined substantially from 31.5% in 2001 to 6.1% in 2011, however, further increased to 8.9% in 2013. Chart-1 shows the status of total assets, total loans and advances and the ratio of NPLs to total loans for the period 2001 to 2013. This high concentration of assets in loans and advances and high NPLs ratios reflect the risk taking behavior of the country's banking sector. The result of high NPLs is that banks are forced to keep the interest rate of loans high. Not only that, high NPLs endanger banks to suffer from capital inadequacy and performance efficiency problem (Wheelock & Wilson, 1994).

1 Financial Stability Report, 2013, Bangladesh Bank, Issue 4, June 2014.

Chart-1: Total Assets, Loans and Advances & NPL ratio of all Banks: 2001-2013



Source: Statistics Department, Bangladesh Bank

The structure of the banking system has changed dramatically over the last two decades. The share of state owned banks assets to total industry assets declined to 26.36% in 2013 from 46.5% in 2001. On the contrary, the privately owned banks (PCBs) share rose from 34.87% in 2001 to 61.85% in 2013 (see Table-1).The market share of PCBs to total industry deposit and advances stood at 62.8% and 69.15% respectively in 2013; while in 1985 the respective share was 18.3% and 13.5% (see Table-2).

Table-1: Share of Total Assets by type of Banks: 2001-2013

(in %)

Year	SCBs	PCBs	FCBs	DFIs
2001	46.50	34.87	6.86	11.77
2002	45.56	36.16	6.81	11.47
2003	41.72	40.81	7.27	10.20
2004	39.62	43.43	7.22	9.73
2005	37.36	45.74	7.25	9.65
2006	32.69	47.69	11.84	7.78
2007	33.09	51.43	8.21	7.27
2008	31.11	54.16	8.02	6.71
2009	28.63	57.38	7.38	6.60
2010	28.50	58.80	6.60	6.10
2011	27.78	60.00	6.56	5.66
2012	26.06	62.18	6.28	5.48
2013	26.36	61.85	6.11	5.68

Source: Annual Reports, Bangladesh Bank Bulletin, Bangladesh Bank, different issues

Table-2: Market share of Deposit and Advances by type of Banks: 1985-2011

(in %)

Year	Deposits				Advances			
	SCBs	PCBs	FCBs	DFIs	SCBs	PCBs	FCBs	DFIs
1985	70.9	18.3	6.4	4.4	58.3	13.5	5.3	22.9
1990	62.4	26.1	7.1	4.4	52.8	21.0	5.8	20.4
1995	62.0	27.9	5.2	4.9	52.4	25.1	5.3	17.2
2000	55.3	31.6	7.1	6.0	47.2	31.1	5.5	16.2
2005	40.5	46.5	7.0	6.0	35.3	49.0	6.5	9.2
2009	29.5	57.8	7.2	5.5	22.8	62.9	7.0	7.3
2010	28.1	60.9	6.1	4.9	21.8	65.4	5.8	7.0
2011	27.3	61.7	6.2	4.8	21.3	66.6	5.6	6.5
2012	25.5	63.6	6.1	4.8	21.08	66.97	5.29	6.67
2013	26.0	62.8	5.7	5.5	18.77	69.15	5.00	7.08

Source: Statistics Department, Bangladesh Bank

The branch network of private sector banks are growing dramatically with 3602 branches in 2013. However, still the banking industry as a whole is being dominated by the state-owned banks (including DFIs) with a branch network of 5014 branches in 2013. As of December 2013, there are 8685 bank branches in Bangladesh, of which SCBs and DFIs together have 58% (see Table-3).

Table-3: Distribution of bank branches by type of Banks: 1985-2009

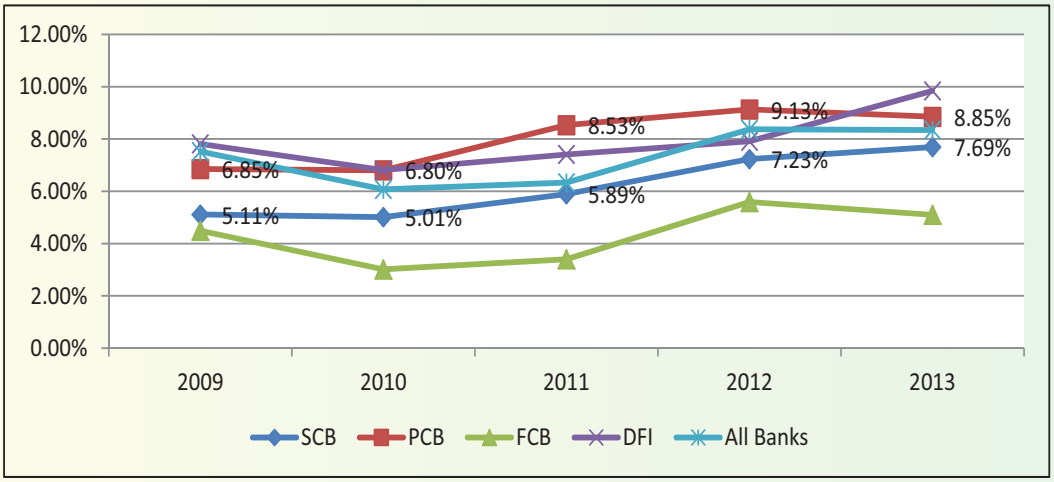
(in %)

Year	Urban					Rural				
	SCBs	PCBs	FCBs	DFIs	Total	SCBs	PCBs	FCBs	DFIs	Total
1985	22.4	7.8	0.4	2.0	32.7	44.6	5.1	0.0	17.7	67.3
1990	21.4	10.2	0.4	2.0	34.0	42.3	5.0	0.0	18.5	66.0
1995	22.7	12.7	0.4	2.5	38.3	39.1	5.5	0.0	17.1	61.7
2000	21.8	15.4	0.6	2.5	40.2	37.1	5.3	0.0	17.4	59.8
2005	19.4	18.9	0.6	2.4	41.2	33.5	6.7	0.0	18.6	58.8
2009	17.9	21.3	0.8	2.3	42.3	31.0	9.3	0.0	17.4	57.7
2010	16.2	23.5	0.8	2.1	42.6	28.2	13.2	0.0	16.0	57.4
2011	15.6	24.3	0.8	2.1	42.8	27.5	14.1	0.0	15.6	57.2
2012	15.06	24.86	0.78	2.1	42.8	26.74	15.26	0.0	15.2	57.2
2013	14.60	25.42	0.79	2.05	42.86	25.93	16.05	0.0	15.15	57.14

Source: Statistics Department, Bangladesh Bank

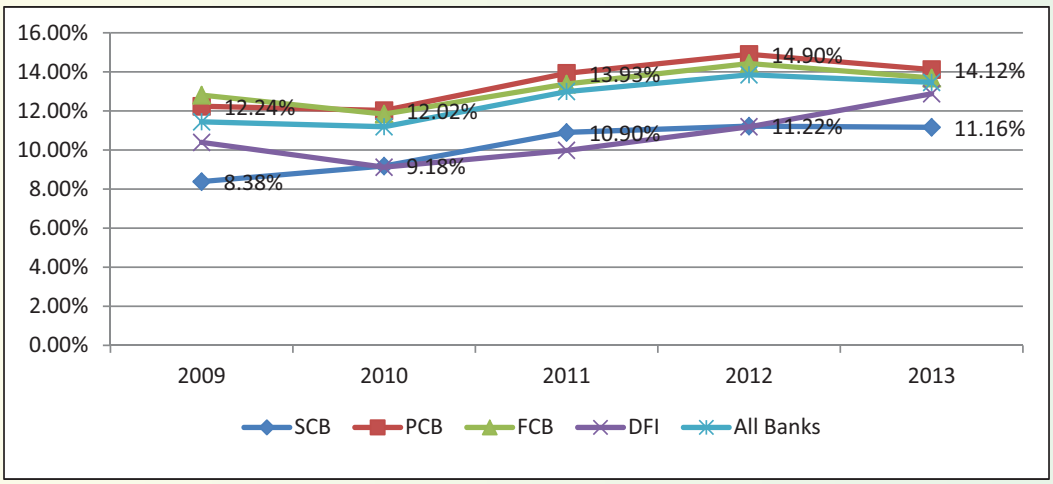
Another important feature of the banking sector in Bangladesh is that the interest rate differentials of deposit and advances among different types of banks. While the SCBs have advantageous position for credit clients; the PCBs, however, have advantages over deposit mobilization due to interest rate. Chart-2&3 make clear the comparative advantageous position of different type banks on deposit and advances.

Chart-2. Weighted Average Interest Rate on Deposits: 2009-2013



Source: Scheduled Bank Statistics, Bangladesh Bank, different issues

Chart-3. Weighted average interest rate on loans and advances: 2009-2013



Source: Scheduled Bank Statistics, Bangladesh Bank, different issues

Since the banking sector plays a vital role in the economic development of the country their efficiency in transforming financial resources is intensively looked at by the stakeholders, government, regulators and the investors. In addition, the efficiency of the banking firms

is closely related to the competitiveness and contestability within and outside the industry.

3. Measurement of Competitiveness and Literature Review

Competition and concentration are very much linked to the product markets and geographical vicinities. Since banks produce and offer varieties of products and serve in different types of market, the structural characteristics, e.g. concentration and competition, are also relevant for banking. It is also argued that concentration and consolidation may affect the structure of competition; and the measure of competition is essential for welfare induced banking related public policy (Bikker and Haaf, 2002a).

In economic literature, there are broadly two typical approaches for measuring competition: structural and non-structural. To model competition, the structural approach roots with industrial organization theory and includes a number of formal measures. Despite the fact that the structural approach presents a theoretical relationship between market concentration and competition, it has some deficiencies in empirical modeling. As a measure, a handful of non-structural or New Empirical Industrial Organization (NEIO) Approaches has been developed which includes Iwata model (1974), the Bresnahan (1982) model, the Lau (1982) model and the Panzar-Rosse (1987) model. These approaches emphasize the competitive conduct by banks without considering the explicit information about the bank market structure.[2]

The Iwata (1974) model estimates the conjectural variations for individual banks that supply homogeneous product in an oligopolistic market. This model requires the estimation of market demand and cost functions of individual banks for obtaining a numerical value of conjectural variation of each bank. This model has been applied once by Shaffer and Di Salvo (1994), as Bikker & Haaf (2002a) reported.

Bresnahan (1982, 1989) and Lau (1982) model are based on the condition of general market equilibrium. These models need an estimation of simultaneous equations of market demand and supply over industry aggregate data. The market power of the average bank is determined by using this supply and demand. However, for empirical study this model needs to define geographic market a priori and a broad range of samples (Shaffer, 1994).

The alternative and the most widely used approach is that developed by Panzar-Rosse (1987). This model allows using firm (bank) level data. Advantages of this model are that no geographic market needs to be defined, and the model also provides a good result even with small samples. One drawback of this method is that it assumes the banking industry is in long-run equilibrium. However, there exists a separate methodology for testing the equilibrium assumption (Claessens&Laeven, 2004). The studies performed by Claessens and Leaven (2004), Goddard and Wilson (2009), Bikker, Spierdijk and Finnie (2006), Bikker and Spierdijk (2008) and Bikker, Shaffer and Spierdijk (2009) are important for the case

2 For details see Bikker & Haaf (2002a)

of Bangladesh, since these studies also include Bangladesh in the samples. These studies cover the period from 1986 to 2005. All the studies observed that monopolistic competition with long-run equilibrium is the nature of the bank market structure of Bangladesh. The estimated H-statistic (P-R Statistic) varies from 0.69 (Claessens& Leaven, 2004) to 0.987 (Goddard & Wilson, 2009). Bikker and Spierdijk (2008), on the contrary, found a decline in H-statistic from 0.96 (1992) to 0.87 (2004); which implies a decline in the competitiveness in the banking market of Bangladesh over time.

The concept of conjectural variation first appeared in static contexts of oligopoly market. A conjectural variation (CV) is a conjecture by one firm in a duopoly about how the other firm will adjust its action with respect to potential adjustments in the first firm's action (Bowley, 1924). As a result, the earliest models of oligopolistic behavior assumed that firms formed expectations about the reactions (or variations) of other firms, now called conjectural variations[3].

Many researchers have used Conjectural Variation Approach (also known as Bresnahan, 1982 and Lau, 1982-referred to as BL method) to study competitive conduct with market power in the banking industry. Shaffer (1989) used the BL method for US banking and strongly rejected collusion, but not perfect competition. Later on, Shaffer (1993) tested the degree of market power for Canadian banking using time series data for 1965-1989 and found perfect competition. Other studies include Angelini and Cetorilli (2003) for Italian banking, Sjoberg (2005) for Swedish banking, Coccorese (2005, 2009) for Italian banking, Rezitis (2010) for Greek banking and so on. However, no studies have been reported yet for the Bangladesh banking industry.

Even though, no empirical study has been found yet that examines the degree of competitiveness solely of the banking industry of Bangladesh. This paper, at least for Bangladesh banking industry, thus contributes in the existing literature on competitive conduct in banking industry and fills the gap in the literature on Bangladesh banking covering recent bank-level panel data.

4. Conjectural Variation Approach & Data:

The conjectural variation approach (a non-structural approach) estimates the conduct or market power directly from the economic model as a free parameter. Appelbaum (1982) suggests a variant measure conjectural variation (CV) approach where conduct along with cost is estimated efficiently. The basic notion of this approach is that it assumes firms' (banks') profit maximizing behavior by setting equilibrium prices and quantities with respect to cost consideration and the degree of competition in the market. The degree of competition, however, depends on the market demand characteristics and firm (bank) conduct.

This model, basically, consists of an inverse demand function and a cost function, of which

3 For details about conjectural variation see Figuierset. al. (2004),"Theory of Conjectural Variations."

the first-order condition of the later defines the supply function. Assume thatthere are N banks in the industry. Consider the industry is producing Q output at price P. Also, let q_i be the output of bank *i*, such that-

$$Q=\Sigma q_i i=1,2\ldots N \qquad \text{(i)}$$

Suppose that, the inverse market demand function (Bresnahan, 1989; Angelini and Cetorilli,2003) can be written as-

$$P=P\,(Q, z) \qquad \text{(ii)}$$

where, z is a vector of exogenous variables that affect demand.

The cost function for bank iis defined by the following way which depends on the level of output (q_i) and on the exogenous vector of input prices (ω_i)-

$$C_i = C_i\,(q_i,\omega_i) \quad \text{(iii)} \qquad \text{(iii)}$$

Thus, the profit function for bank i is-

$$\pi_i = P(Q,z).\ q_i - C_i(q_i,\omega_i) \qquad \text{(iv)}$$

Maximization of (iv) w.r.t q_i yields-

$$\frac{\delta\pi_i}{\delta q_i} = P+q_i \frac{\delta P}{\delta Q} \times \frac{\delta Q}{\delta q_i} - \frac{\delta C_i(qi,\omega_i)}{\delta q_i} = 0$$

$$\text{Or,} \qquad P = MC_i(q_i,\omega_i) - q_i \quad \frac{\delta P}{\delta Q} \times \frac{\delta Q}{\delta q_i} \qquad \text{(v)}$$

$MC(q_i,\omega_i)=\delta C_i/\delta q_i$ is the marginal cost for bank i. By rearranging, equation (v) can be written in a stylized from as-

$$P= MCi(qi,\omega i) - Q\left(\frac{\delta P}{\delta Q}\right)\left(\frac{\delta Q}{\delta q_i}\right)\left(\frac{q_i}{Q}\right) \qquad \text{(vii)}$$

$$P= MC_i\,(q_i,\omega_i) - \lambda.\ h\,(Q,z)$$

Here, $(\delta Q/P)/\delta Q)^{-1}= \eta$ is market demand semi-elasticity of price and $(\delta Q/q_j)(\delta q_j/Q)=\varnothing_i$ is the conjectural elasticity of total industry output in respect to the output of bank i.

And, $\lambda=\delta Q/\delta q_i$ is the conjectural variation parameter/derivative of bank i and measures the degree of market power. If $\lambda=0$, the market is said to be perfectly competitive since it yields Eq. (5.7) P=MC. If $\lambda=1$, a perfect cartel we perceive and $0<\lambda<1$ reflects various oligopoly regime (e.g. monopolistic competition). A value of $\lambda=-1$, reveals a Bertrand competitive conjecture (Telser, 1972), wherein an increase in output by one bank is exactly offset by a decrease of its rival banks, so that the market price remains unchanged.

The estimation of the conjectural variation parameter λ requires the simultaneous estimation of equations (i), (iii) and (vii).

4.1. Empirical Modeling:

To estimate λ, a demand function, a cost function and a supply relation are required. Note that the marginal cost function is attributed as the supply relation.

In this paper, a log-linear demand function is applied[4]. It is not necessary to include an interactive term in the demand function for identification purpose (Sjoberg, 2005) due to the log-linear form. Corresponding to Eq. (i), the market demand function is specified as-

$$\ln Q_t = \alpha_0 + \alpha_1 \ln P_t + \alpha_2 \ln Y_t + \alpha_3 \ln Z_t + \in_t \qquad \text{(viii)}$$

where Q_t= Quantity of market output at time t

P_t= Market price of output of at time t

Y_t= National income which reflects economic activity at time t

$Z_{t,}$= an exogenous variable substituting for banking service at time t

ω_t =error term.

Like many studies on the banking industry (Mester, 1987; Berger et al., 1987; Shaffer, 1993; Coccorese, 2004, 2009), I also employ a trans-log cost function which is a second order Taylor expansion of any cost function[5]. Consistent with the intermediation approach and considering a three-input (funds e.g. deposits, employee and physical capital) specification, the corresponding trans-log cost function can be written as-

$$\begin{aligned}\ln C_{it} = {} & \beta_0 + \beta_1 \ln q_{it} + \beta_2/2(\ln q_{it})^2 + \beta_3 \ln \omega_{1it} + \beta_4 \ln \omega_{2it} + \beta_5 \ln \omega_{3it} \\ & + \ln q_{it}\beta_6 \ln \omega_{1it} + \ln q_{it}\beta_7 \ln \omega_{2it} + \ln q_{it}\beta_8 \ln \omega_{3it} \\ & + \beta_9/2(\ln \omega_{1it})^2 + \beta_{10}/2(\ln \omega_{2it})^2 + \beta_{11}/2(\ln \omega_{3it})^2 \\ & + \beta_{12} \ln \omega_{1it} \ln \omega_{2it} + \beta_{13} \ln \omega_{1it} \ln \omega_{3it} + \beta_{14} \ln \omega_{2it} \ln \omega_{3it} + \varphi_{it} \qquad \text{(ix)}\end{aligned}$$

where, φ_{it} is the error term. C is the total cost and ω_k (k=1, 2, 3) is the input prices for bank i. Some usual conditions on the trans-log cost function are imposed as specified by Berger et al. (1987). Particularly, Eq. (ix) does not require the test for symmetry condition as banks produce composite products (Sjoberg, 2005; Coccorese 2004, 2009). However, according to Bresnahan (1989), proper identification of λ requires the property of linear homogeneity (of degree 1) in input prices on the marginal cost function. That is, the following restriction is imposed:

$$\beta_3 + \beta_4 + \beta_5 = 1 \qquad \text{(R1)}$$

$$\beta_6 + \beta_7 + \beta_8 = 0 \qquad \text{(R2)}$$

$$\beta_{12} + \beta_{13} + \beta_{14} = 0 \qquad \text{(R3)}$$

4 See Berg and Kim (1994), Coccorese (2004, 2009), Sjoberg (2005).
5 It is also a generalization of Cobb-Douglas functional form.

The trans-log cost Eq. (ix) implies the following marginal cost function:

$$MC_{it} = \delta C_{it}/\delta q_{it} = C_{it}/qi_t(\beta_1+\beta_2 lnq_{it}+\beta_6 ln\omega_{1it}+\beta_7 ln\omega_{2it}+\beta_8 ln\omega_{3it}) \quad (x)$$

Substituting (x) into (vii) and simple manipulation yields the supply relation as-

$$P_{it} = C_{it}/qi_t\ (\beta_1+\beta_2 lnq_{it}+\beta_6 ln\omega_{1it}+\beta_7 ln\omega_{2it}+\beta_8 ln\omega_{3it}) - \lambda(P/\alpha_1)+\gamma_{it} \quad (xi)$$

where, γ is an error term.

Thus, to identify λ the system of equations (viii), (ix) and (xi) are estimated simultaneously. A positive value of λ shows the presence of collusive behavior; while a negative value reflects competitive behavior. Since, average output data is employed; thus, λ reflects average conduct over separate product markets and over the years under the sample. It also reflects the conduct of an average sample bank even though banks enjoy varying degree of market power. Shaffer (2001) also acknowledged that the interpretation of λ as average conduct is valid regardless of the holding of long-run equilibrium condition during the period under sample. Note that, the system of equations (viii), (ix) and (xi) does not suffer from the identification problem[6].

4.2. Model Specification:

For estimating λ using a panel data framework, the system of equation (viii), (ix) and (xi) are re-specified under the following manner:

$$lnTLNS_t = \alpha_0+\alpha_1 lnMPL_t+\alpha_2 lnGDP_t+\alpha_3 lnTBILL91_t+\in_{it} \quad (xii)$$

$$\begin{aligned} lnTC_{it} = {} & \beta_0+\beta_1 lnLNS_{it}+\beta_2/2(lnLNS_{it})^2+\beta_3 lnPD_{it}+\beta_4 lnPP_{it}+\beta_5 lnPK_{it} \\ & +lnLNS_{it}\beta_6 lnPD_{it}+ lnLNS_{it}\beta_7 lnPP_{it}+ lnLNS_{it}\beta_8 lnPK_{it} \\ & +\beta_9/2(lnPD_{it})^2+\beta_{10}/2(lnPP_{it})^2+\beta_{11}/2(lnPK_{it})^2 \\ & +\beta_{12} lnPD_{it} lnPP_{it}+\beta_{13} lnPD_{it} lnPK_{it}+\beta_{14} lnPP_{it} lnPK_{it}+\varphi_{it} \end{aligned} \quad (xiii)$$

$$\begin{aligned} PL_{it} = {} & TC_{it}/LNSi_t\ (\beta_1+\beta_2 lnLNS_{it}+\beta_6 lnPD_{it}+\beta_7 lnPP_{it}+\beta_8 lnPK_{it}) \\ & -\lambda(MPL_t/\alpha_1)+\gamma_{it} \end{aligned} \quad (xiv)$$

Relying on the intermediation model (Klein, 1971; Sealey and Lindley, 1977) of a bank, which assumes labor (employees) with other physical capital are used to obtain deposit and finally to originate loans, we consider here loans (LNS) as the output of a bank. The variables are defined as follows-

LNS_{it} = Loans and Advances of Bank I at time t.

$TLNS_t$ = Total amount of Loans and Advances of all banks at time t

MPL_t = Market Price of Loans at time t (measured as weighted average market interest rate of loans)

6 For details, see Hill, Griffiths and Lim (2008), p-308.

GDP_t = Gross Domestic Product at current prices at time t.

$TBILL91_t$ = Rate of 91 days Treasury bill (as a proxy for substitute of bank loans)

TC_{it} = Total Cost of Bank i at time t.

PD_{it} = Price of Deposit of Bank i at time t (measured as ratio of interest expense to deposits).

PP_{it} = Price of Personnel of Bank i at time t (measured as ratio of personnel expense to total assets).

PL_{it} = Price of Loans of Bank i at time t (measured by interest rate)

PK_{it} = Price of physical capital of Bank i at time t (measured as ratio of operating expenses net of personnel expense to total assets).

TC_{it}/LNS_{it} = Average Cost at time t (measured as ratio of Total Cost to Loans).

Since the number of employees is not available for all banks, I consider total assets as a proxy as denominator for calculating the price of labor and physical capital.

4.3. Data Structure:

This study covers bank-level data on 36 commercial banks in Bangladesh for the period 2001 to 2013. A panel of data has been prepared by gathering data from the annual reports of the said years for the sample banks except GDP, 91 days T-Bill (TBILL91) rate, and market interest rate of loans (MPL). Data on GDP, TBILL91, and MPL have been collected form Economic Trends, a publication of Bangladesh Bank.

The panel data framework allows identifying different conduct parameters for different groups of banks. From the whole sample we, thus, also make two other sub-samples based on the ownership structure of the sample banks. The first sub-sample covers 5 state-owned banks (SCBs) for the year 2001 to 2013. On the contrary, the second sub-sample covers 31 privately owned banks (PCBs) for a period of 2001 to 2013.

The system of equation (xii), (xiii) and (xiv) have been estimated simultaneously through iterative nonlinear seemingly unrelated regression (SUR) and full information maximum likelihood (FIML) method. The simultaneous equation system could also be estimated through generalized method of moments (GMM), two-stage least squares (2SLS) or three-stage least squares (3SLS). However, GMM, 2SLS and 3SLS are instrumental variable estimators and problems were encountered selecting relevant instruments.

SUR, also known as joint generalized least squares, can be used to estimate systems of equations with correlated random errors. On the other hand, FIML is a system generalization of the limited information maximum likelihood (LIML) estimator and assumes that the equations errors have a multivariate normal distribution. Compared to the instrumental variables methods (e.g.2SLS ,3SLS), the FIML method has the advantages that it does not require instrumental variables, includes the full equation system, with as many equations

as there are endogenous variables[7]. This paper, thus, uses SUR and FIML estimation methods.

5. Empirical Results and Discussions

The estimation of the system of equations (xii), (xiii) and (xiv) is reported in Table-4(for SUR) and Table-5(for FIML). The goodness of fit of each of three equations is satisfactory as reported by the values of R^2. Both of the SUR and FIML method returns almost the same values of R^2.

Table-4: System Estimation Results (Software: Eviews 6.0)

	SUR					
Regressor (Parameter)	**All Banks**		**SCBs**		**PCBs**	
	Parameter	t-value	Parameter	t-value	Parameter	t-value
	Demand Function (Dependent Variable: ln TLNS)					
Constant (α_0)	-6.180*	-66.195	-6.740*	-25.987	-6.182*	-61.433
ln MPL (α_1)	-0.140*	-7.906	-0.190*	-3.600	-0.141*	-7.385
ln GDP(α_2)	1.297*	269.455	1.325*	97.106	1.297*	249.990
ln TBILL91(α_3)	-0.019**	-2.237	-0.024	-0.902	-0.019**	-2.072
R^2	0.996		0.995		0.996	
	Cost Function (Dependent Variable: lnTC_i)					
Constant (β_0)	-0.561	-0.185	14.705	1.234	2.809	0.817
ln LNS (β_1)	0.629*	4.163	1.844*	3.793	0.383**	2.095
$(\ln LNS)^2$ (β_2)	0.021*	3.745	-0.162*	-5.456	0.027*	4.140
ln PD (β_3)	-0.474	-0.801	-1.197	-0.376	-0.113	-0.172
ln PP (β_4)	-0.687	-0.892	4.774	1.395	-0.481	-0.549
ln PK (β_5)	0.204	0.563	4.229*	2.813	0.691	1.629
ln LNS*lnPD (β_6)	-0.013	-0.573	-0.210***	-1.944	-0.027	-0.988
ln LNS*lnPP (β_7)	0.011	0.595	0.006	0.064	0.020	0.936
ln LNS*lnPK (β_8)	-0.025***	-1.730	-0.062	-1.188	-0.063*	-3.868
$(\ln PD)^2$ (β_9)	0.088*	2.935	-1.187**	-2.077	0.097*	2.864
$(\ln PP)^2$ (β_{10})	-0.061	-0.580	0.522	0.839	-0.096	-0.857
$(\ln PK)^2$ (β_{11})	0.171*	2.745	0.498*	2.712	0.100	1.268
ln PD*lnPP (β_{12})	-0.057	-0.600	0.204	0.471	-0.041	-0.375
ln PD*lnPK (β_{13})	-0.239*	-3.718	-0.274	-0.865	-0.216*	-2.824

7 For more details SAS/ETS 9.2 user guide, SAS Institute Inc. (2008)

ln PP*lnPK (β_{14})	-0.059	-0.948	0.345	1.3336	0.025	0.338
R^2	0.982		0.995		0.977	
	Supply Relation (Dependent Variable: PL_i)					
Conduct (λ)	0.011*	4.164	-0.021**	-2.595	0.016*	5.007
Wald Test						
χ_2 value ,H_0:λ=0 P Value	17.428 0.0000[a]		6.793 0.0092[a]		25.074 0.0000[a]	
χ_2 value, H_0:λ =1 P Value	149511.1 0.0000[a]		16404.5 0.0000[a]		96237.96 0.0000[a]	
χ_2 Value H_0:λ =-1 P Value	156037.7 0.0000[a]		15096.4 0.0000[a]		102551.9 0.0000[a]	
R^2	0.610		0.609		0.669	
No. of Observation	324		50		279	

t-values in the Parentheses. *,**and *** indicates significant at 1%, 5% and 10% level respectively. a. Rejects the null hypothesis.

Table-5: System Estimation Results (Software: Eviews 6.0)

	FIML					
Regressor (Parameter)	**All Banks**		**SCBs**		**PCBs**	
	Parameter	Z-Stat	Parameter	Z-stat	Parameter	Z-Stat
Demand Function(Dependent Variable: ln TLNS)						
Constant (α_0)	-6.184*	-26.642	-6.607*	-14.384	-6.187*	-24.586
ln MPL (α_1)	-0.141*	-6.793	-0.187**	-2.059	-0.141*	-6.361
ln GDP(α_2)	1.297*	97.516	1.316*	44.097	1.297*	90.193
ln TBILL91(α_3)	-0.019	-1.364	-0.030	-0.737	-0.019	-1.264
R^2	0.996		0.995		0.996	
Cost Function (Dependent Variable: $lnTC_i$)						
Constant (β_0)	-0.225	-0.072	16.284	1.108	5.477	1.579
ln LNS (β_1)	0.659*	3.625	1.556***	1.704	0.218	0.998
$(\ln LNS)^2$ (β_2)	0.012	1.529	-0.181*	-3.310	0.026*	3.311
ln PD (β_3)	-0.642	-1.177	-2.238	-0.358	0.015	0.024
ln PP (β_4)	-0.459	-0.596	5.141	1.289	-0.060	-0.068
ln PK (β_5)	0.339	0.554	4.485	1.288	1.050**	2.237
ln LNS*lnPD (β_6)	-0.006	-0.215	-0.255**	-1.973	-0.033	-1.105
ln LNS*lnPP (β_7)	-0.002	-0.069	-0.038	-0.264	0.003	0.135
ln LNS*lnPK (β_8)	-0.029	-1.528	-0.088	-0.755	-0.082*	-4.008
$(\ln PD)^2$ (β_9)	0.062***	1.852	-1.320	-0.864	0.072***	1.686

$(\ln PP)^2$ (β_{10})	-0.077	-0.633	0.244	0.259	-0.100	-0.759
$(\ln PK)^2$ (β_{11})	0.097	1.216	0.532	1.350	0.040	0.506
ln PD*lnPP (β_{12})	-0.098	-1.031	0.300	0.438	-0.051	-0.446
ln PD*lnPK (β_{13})	-0.194*	-2.842	-0.560	-0.986	-0.170**	-2.042
ln PP*lnPK (β_{14})	0.011	0.143	0.498	1.022	0.099	1.086
R^2	0.980		0.994		0.975	
Supply Relation (Dependent Variable: PL_1)						
Conduct (λ)	0.011*	3.956	-0.016	-1.389	0.016*	4.548
Wald Test						
χ_2 value ,H_0:λ =0 P Value	15.653 0.0001[a]		1.930 0.1648		20.686 0.0000[a]	
χ_2 value, H_0:λ =1 P Value	125030.1 0.0000[a]		7450.3 0.0000[a]		77835.3 0.0000[a]	
χ_2 Value H_0:λ =-1 P Value	130688.6 0.0000[a]		6978.4 0.0000[a]		82993.7 0.0000[a]	
R^2	0.623		0.635		0.687	
No. of Observation	324		50		279	

t-values in the Parentheses. *,**and *** indicates significant at 1%, 5% and 10% level respectively. a. Rejects the null hypothesis.

As it is evident in Table-4 and Table-5, the estimated coefficients obtained by the two methods are very similar both in sign and significance. The magnitude of the estimated parameters is, albeit, similar in both of the estimation methods. Table-4 and Table-5 reports the estimation results for three sets of samples: all banks, state-banks (SCBs) and private banks (PCBs). Last two samples (SCBs and PCBs) are categorized in terms of the ownership structure.

Both State Owned and Private Banks:

In the demand equation, both SUR and FIML estimates yields parameters that are statistically significant at 1% and 5% level of significance. The sign of the coefficient of market price (α_1) is negative and significantly different from zero which is consistent with the downward sloping market demand curve. In terms of magnitude the value of α_1 is -0.14 (in both SUR and FIML). The variable GDP has an expected significantly positive coefficient (α_2). The coefficient of TBILL91, proxy of a substitute of banking services, is expected to be positive[8]. However, the sign of estimated coefficient (α_3) is negative and significant at 5% level only in the SUR method. The lower magnitude of TBILL91

8 TBILL91 has been considered as a proxy of the price of substitute of bank loans. If this is a good measure, then it should take a positive coefficient. For example, if TBILL91 reflects the short term market interest rate, then it may be the case that the investors have less inclination to go for alternative source of financing if the rate of TBILL91 is higher. Therefore, the demand for bank loans may also be higher.

indicating that the demand for the banking output (e.g. loans) is not so sensitive to the price changes of the substitute product.

The overall fit of the cost equation is very good as indicated by the estimated R^2. Both SUR and FIML report the coefficient loans (β_1) is significantly positive and the magnitude (0.629 and 0.659) reflects that in Bangladesh, banks have to bear significant searching and scrutinizing cost for extending loans. The sign of the price of deposit (β_3) and personnel (β_4) are expected to be positive. However, the results (in both methods) show a negative sign though these are not statistically significant. It can be explained by the way in that the overall banking market does not suffer from a liquidity problem.

In the supply relation, the value of the estimated conduct parameter (λ) is positive and statistically significant at the 1% level. The magnitude of this parameter (0.011) is small and indicates that banks on average exercised a very low degree of market power.

SCBs and PCBs

Table-4 and Table-5 also report the result for the sub-samples of SCBs and PCBs. The sign of the parameters are similar to the case of all banks.

In the demand equation, most of the parameters are statistically significant except TBILL91 for the case of SCBs. In the cost equation, the magnitude of the parameter loans (β_1) varies between the two categories of banks (1.844 for SCBs and 0.383 for PCBs). The greater magnitude for SCBs may be attributed to the presence of huge non-performing loans in the portfolio. Though the coefficient of the price of personnel (β_4) is not significant, the positive sign and magnitude indicates that SCBs are, albeit, overstuffed.

A notable difference was observed in the estimated conduct parameter (λ) in the supply relation. In case of SCBs the sign of conduct parameter is negative (-0.021 and -0.016), wherein it is only significant in SUR estimation method. On the contrary, the sign of the conduct parameter for PCBs is positive (0.016) and statistically significant at 1% level.

5.1. Hypothesis Testing and Interpretations of Parameters

The full sample SUR and FIML estimation of the conduct parameter (λ) is 0.011. The Wald Chi-square (χ_2) testshows that the value is significantly different from zero at 1% level of significance; that is the hypothesis of perfect competition is rejected. By the same Wald test the hypothesis of perfect collusion (λ=1) and Bertrand competitive conjecture (λ=-1) are strongly rejected as shown in Table-4 and Table-5. The positive value of λ (but <1) indicating that the overall market can be defined as a nature of monopolistic competition. It is also true for the samples of private banks (PCBs).

However, the sample of state banks (SCBs) shows a different result. The conduct parameter (λ) is significantly different from zero in case of SUR estimation, while the FIML does not reject the null hypothesis of λ=0. The Wald test rejects the hypotheses of perfect competition, perfect cartel as well as the Bertrand competitive conjecture. The negative value of λ (-0.021) can be interpreted as a local estimate of the percentage deviation of aggregate output from the competitive equilibrium level (Shaffer, 1993). Consistent with Eq. (vii), it can be said that SCBs charge a markup above the MC to the borrowers; this may

indicate a power of transferring the cost of non-performing loans to the existing borrowers.

Table-6: Measures of Performance

Sample	P_i	MC	AC	L^9 (%)	λ
All Sample	0.115243	0.087358	0.113488	24.20	0.011
SCBs	0.084109	0.080920	0.097762	3.79	-0.021
PCBs	0.120196	0.085943	0.114760	28.50	0.016

In Table-6, the key performance measures are summarized for all samples, SCBs and PCBs. The values of prices (P_i), marginal cost (MC) and average cost (AC) are calculated average values for the respective samples. Since the AC is higher than the MC, there exist scale economies in the banking industry of Bangladesh. Hence it is evident from the Table-6, that the average conduct and average degree of market power, represented by L, varies between SCBs and PCBs. PCBs enjoy a greater market power (28.5%) compared to that of SCBs (3.79%). The average learner index for market power is 24.20% which is a development of the earlier study over the period of 1995-99 by Maudos-Villaroya, J. (2005)[10].

6. Conclusions

In the modern age, commercial banks are considered as the nerve system of a country's economic development. The roles of banks are manifold: capital formation, monetization, implementation of monetary policy, payment functions and many more. Not only that, banks perform as an actor to transform the corn[11] economy to monetary economy by certifying the credit worthiness of the borrowers, reducing information asymmetry between creditors and borrowers as well as supplying credit (Stiglitz & Greenwald, 2003).In other words, an effective, efficient and disciplined banking and financial system fosters economic growth in various sectors of the economy.

This paper has investigated the efficiency, productivity change and competitiveness of the banking industry in Bangladesh. Employing a non-structural conjectural variation approach on a panel data framework consisting of 36 banks for 2000-2009, this paper finds that the overall banking market is characterized as being monopolistic competition. The results, however, shows that PCBs are more competitive than the SCBs. Eventually, SCBs market seem to be a conjectural variation. In addition, the result of conjectural variation approach reveals more market power is exercised by the PCBs (28.5%) than the SCBs (3.79%). This result is consistent with the hypothesis of a contestable market as referred by Baumol (1982).

The results may reveal that banks in Bangladesh could have taken relationship lending/ banking strategies (Petersen & Rajan, 1998) and might have ensure stability in the financial

9 The Learner Index, L is calculated as L=(P-MC)/P.

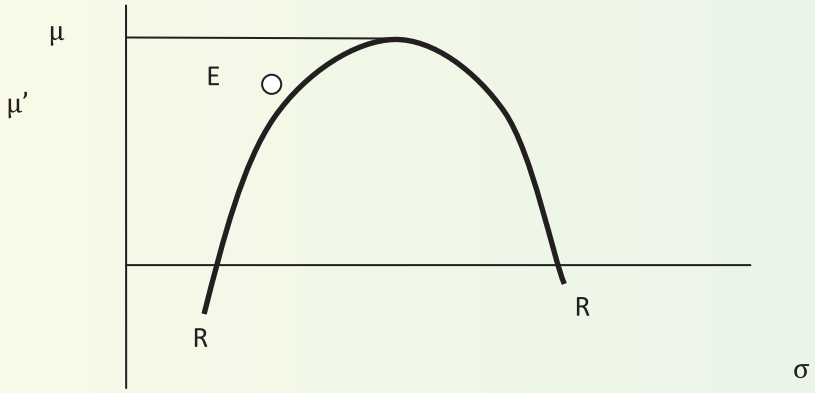
10 Maudos-Villaroya, J. (2005) estimated the learner index of the banking industry of 58 countries including Bangladesh. The estimated learner index over the period of 1995-99 was 4.80%

11 Corn economy refers to a primitive non-monetary economy i.e. an economy without the presence of money.

market protecting themselves encountered from the lemon market (Shaffer, 1998). Under the relationship banking banks are more risk averse and charge interest rate for loans below the point where the expected return is maximized (Stiglitz& Greenwald, 2003).

Figure-1: Loan Opportunity Set

The economic growth of Bangladesh is largely influenced by the efficient and successive performance of commercial banks, since other participants have a minor contribution in the financial system. Due to a volatile capital market, and banks participation both as major listed companies and in share trading, Bangladesh Bank[12] has to be more vigilant on the performance of the commercial banks. As such, this research paper advocates the following recommendations.



The government of Bangladesh should be careful about the competitiveness of the banking industry as a whole. Competition does not always be a welfare maximizing. For instance, perfect competition in banks in Bangladesh means regulations should be relaxed for easy entry and exit of the banks. That might not be a good choice since banking product is purely different from conventional goods.

The findings also may help the regulators whether to increase competition in the banking industry by allowing more banks, but with the fortune of "winner's curse". Henceforth, stability in the financial market is also determined or influenced by the existing bank market structure.

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Determinants of Remittance Inflows to Bangladesh: A Gravity Model Approach using Panel Data

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Abstract

This paper examines the determinants of remittance inflows to Bangladesh considering the vital role it plays in the economy of Bangladesh and the ability of the gravity model to explain cross-country flows of remittances. Application of the gravity model to international trade and migration may provide valuable insights in explaining the underlying determinants of cross-border flows such as remittances and take effective policy actions in the face of any unforeseen adverse shock as seen in the negative remittance growth in 2013. We, therefore, apply a gravity model of remittances to a panel dataset comprising 13 countries for 2002-2013. Our study incorporates several additional economic factors e.g., consumer prices, unemployment rate, credit by the financial system, output gap in migrant destinations relative to Bangladesh, the presence of bilateral labor trade agreements between two countries, whether the migrant destination country is an oil exporting country or not, in addition to typical gravity variables. Results of estimated models show that GDP per capita, migrant stock, foreign exchange rate, and output gap are significant determinants of remittances at conventional significance levels.

Key words : Remittance flows, migrant stock, gravity model, panel data models, and geographical distance

JEL classification : F22, F24, J61, J71, O11, O24, C23

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I. Introduction

Remittance inflows provide lifeline to millions of Bangladeshi migrants and their families through the creation of employment, smoothening of consumption, and unlocking of investment opportunities. Most researchers and policymakers now recognize that remittances inflows play notably positive roles in sustaining Bangladesh's current account balance, comfortable foreign exchange reserve, stable foreign exchange rate, diminishing foreign aid dependence and declining poverty rates. In fact, external sector in most countries of South Asia such as Nepal, Bangladesh, and Pakistan will be rendered vulnerable in the absence of sustained remittance inflows.

Official data on remittances to Bangladesh is available from 1976 onwards. During this period, remittance inflows exhibited a notable upward trend as a percentage of GDP. From a tiny 0.19% of GDP, these flows grew to 1.87% in 1980 to 3.74% in 1983 and in the following years till 2000 remittances hovered around 2.32% and 3.95% with a fluctuating but gradually increasing trend and crossed the 4% mark in 2001. Since 2001 till 2012 remittances displayed an impressive upward drift amid some minor fluctuations. Remittances as percentage of GDP first a hit double-digit level (10.07%) in 2008 and rose to 10.68% in 2012. However, in 2013 remittances as percentage of GDP decelerated to 9.24% owing to crackdown of illegal migrants in the middle- east countries.

Bangladesh experienced negative remittance growth of 1.8% compared to the previous year (World Bank). The negative remittance growth alerted concerned migrants and policymakers with regard to prospects of future remittance inflows. Fortunately, remittances rebounded and posted significantly positive growth rate.

Since sustainable inflows of remittances and their occasional lapses play crucial importance in the economic stability of Bangladesh, a comprehensive understanding of the underlying factors is vital. Literature abounds on the microeconomic and macroeconomic determinants of remittances regarding other countries but studies explaining the case of Bangladesh is inadequate. In particular, comprehensive theoretical and empirical studies on Bangladesh are scant. The gravity model of remittances may reveal the underlying factors of remittance inflows as it has helped explain cross-country flows of trade, foreign direct investment, migration, and remittances in previous studies and provided valuable insights on the factors determining these international flows.

The current study applies the gravity model to examine the major determinants of remittance flows to Bangladesh. Although a number of studies investigated the determinants of remittance flows to Bangladesh, it is important to check whether the remittance flow dynamic still holds relevant for policy makers. Our study applies a number of panel data analysis techniques with various specifications to estimate and test if the estimates are consistent and robust. We also attempt to augment the gravity model to test the influence of a number of macroeconomic variables, e.g., consumer prices, unemployment rate, credit by the financial system, output gap in migrant destination countries relative to Bangladesh.

The rest of the paper is organized as follows. The next section surveys relevant literature (Section II). Based on literature survey and data availability, we attempt to develop the model, data set, and estimation methods (Section III). Then we estimate and report our results (Section IV). Finally, we conclude, and discuss some policy implications (Section V).

II. Literature Review

The existing body of literature on the determinants of remittances is growing in terms of the variety of data coverage, methodology, and approaches due mainly to its vital importance in the economy of many countries across the world. Both theoretical and empirical, microeconomic and macroeconomic studies on remittances are available that highlight different aspects of the determinants of remittances. This paper will mostly be limited to explore, develop, and then apply a gravity model of remittances to explain the factors influencing remittance inflows to Bangladesh.

The application of Newton's gravity (1867) model in economics traces back to Tinbergen's (1962) pioneering paper to explain the determinants of international trade flows. Like Newton's gravity model (which explains the force of gravitation between two bodies in the universe based on the mass of the two bodies and the distance between them), the gravity model of trade also tried to explain the determinants of trade based on the size of GDP between two economies and the geographical distance between them.

Following Head (2003) we may express the gravity equation for bilateral flows as

$$F_{ij} = G\frac{M_i^{\alpha} M_j^{\beta}}{D_{ij}^{\theta}}$$

where F_{ij} stands for bilateral flows from country i (e.g., remittance sending country) to country j (e.g. remittance receiving country), Gisa gravitational constant, M_i and M_j denotes the size of GDP of country i and j respectively with α, β showing the elasticity of the two countries, D_{ij} is the distance between country i and country j and θ is the elasticity of F_{ij} with respect to D_{ij} .

Since his pioneering work, many researcher examined flows of international trade, migration, foreign direct investment, and remittances by using the gravity model. Fortunately, despite having no theoretical basis in economics, the gravity model could be successfully applied to empirical analysis of these macroeconomic variables and produced useful results.

The gravity model of remittances is an important extension to this literature trying to examine the determinants of remittances. Most studies on the determinants of remittances highlighted either microeconomic or macroeconomic determinants of remittances. A number of studies also attempted straightforward atheoretical replication of the Gravity

model in the tradition of the gravity model of trade though gravity models of trade are already grounded in economic theories. We have not seen the application of economic theory-based gravity model of remittances in Bangladesh context.

Drawing upon insights from Sjaastad (1962), Wadycki (1973), Greenwood (1975), Schultz (1982), and Borjas (1987, 1989), a study by Karemera et al. (2000) developed and examined a labor-theory based gravity model of international migration to North America using panel data analysis. The labor-theory based gravity model of migration by Karemera et al. (2000) was compatible with the analysis of international migrant flows revealing that in addition to population and income variables, political variables were also important determinants of migration.

In contrast, Lueth and Ruiz-Arranz (2006) examined an atheoretical gravity model of remittances by using a panel dataset of bilateral remittance flows for selected countries over the 1979-2004 period and found that a few gravity variables were able to explain remittance flows although their finding did not show complete conformity with predictions by other studies on a number of variables. The study found significant impacts of the gravity variables such as the size of GDP and the distance across countries although it found mixed evidence on the motives to remit, altruism or investment.

This paper paper develops and applies a gravity model of remittances similar to Karemera et el. (2000) attempting to consider some economic reasoning for the variables in addition to conventional gravity variables compared to atheoretical application of the gravity model in Lueth and Ruiz-Arranz (2006).

Ahmed and Martinez-Zarzoso (2014) applies a gravity model using replacing distance with transaction costs.The study finds that economic performance of the migrant's home country has significant effect on remittances. The study also finds that migrants tend to send more remittances during political instability, which supports the countercyclical and altruistic motive to remit.

Mahapatra and Ratha (2010) highlighted three factors in determining the flow of remittances, namely, stock of migrants in different migrant-destination countries, the incomes in the migrant sending countries, and income in the migrant sending countries. Ratha and Shaw (2007), Freund and Spataforta (2008), Lueth and Ruiz-Arranz (2008), Sing et al. (2009) cited in Mahapatra and Ratha (2010) identifies the size of emigrant stock as the most important determinant of remittances. Unfortunately, the stock of emigrants is neither recorded nor estimated in Bangladesh since no records on returnee migrants are maintained although the data on flow of outbound Bangladeshi migrants is available.

Sayan (2012) and World Bank (2005) found that remittances are counter-cyclical in poor countries like Bangladesh and India (which supports altruistic motive) whereas these flows are pro-cyclical in middle-income countries.

Dustmann, and Mestres (2010) examined if there is any distinction between temporary and permanent migration in terms of remittances sent to migrant's home countries and found

that the type of migration plan, i.e. the nature of return plans were related to large changes in remittance flows.

Nighat and Balgrami (1993) investigated the determinants to Pakistan and found both altruism and self-interest as migrants' motives for sending remittances to Pakistan. The study also suggested that unskilled workers tend to remit more than skilled workers.

Our paper contributes to the existing literature of the gravity model of remittances in the following ways. First, we fill in gap in literature on the gravity model of remittances on Bangladesh, Second, we develop a gravity model that is closely aligned with economic reasoning in examining remittance flows. Third, in order to investigate the factors affecting the flow of remittances we attempt to identify a number of variables that were not so far examined in the literature. Fourth, we attempt to estimate migration stock, one of the most important determinants of remittances, from available stock data that are sporadic by nature but we combined it with migrant flow data and average number of years migrants tend to stay in the destination countries. Finally, we also examine the effect of two potentially important dummy variables, namely the presence of manpower trade agreements between Bangladesh and destination countries and whether the destination country is an oil exporting country.

III. Model. Data,and Methodology

The Gravity Model

This paper derives a gravity model of remittances arguments of Karemera et al (2000) in economic modeling of the equation of gravity suggested by Wadycki (1973), Greenwood (1975), Schultz (1982), and Borjas (1987,1989).

Our benchmark gravity model of remittances may be represented as

$$lrem_{jb}=\alpha_j+\beta_1 lgpc_{jb}+\beta_2 ldist_{jb}+\beta_{23} lmig_{jb}+\beta_4 fxr+\in_{jb}$$

where $j=1,\ldots,13$ which represent the destination countries of migrants, b stands for Bangladesh, and $\in$ represents the stochastic disturbance term. All the variables are expressed in natural logarithm and the time subscript t is dropped for convenience. The β s are parameters to be estimated.

On the other hand, the augmented gravity model of remittances be expressed as follows:

$$lrem_{jb}=\alpha_j+\beta_1 lgpc_{jb}+\beta_2 ldist_{jb}+\beta_{23} lmig_{jb}+\beta_4 fxr+\beta_5 lrelp_{jb}+\beta_6 relu_{jb}+\beta_7 relc_{jb}+\beta_8 opg_{jb}+\delta_1 mou_{jb}+\delta_2 oec_{jb}+\in_{jb}$$

where δ_1 and δ_2 are parameters of the dummy variables: whether a bilateral labor contract between migrant destinations and Bangladesh (*mou*) exists and whether the migrant destination is an oil exporting country *(oec)*. Other additional variables in the augmented model are price levels (relp), unemployment rate (relu), credit by the financial sector (relc), and output gap (opg) (as a percentage of GDP) in migrant destinations relative to Bangladesh respectively.

Data

We use yearly remittance[5] inflows to Bangladesh from 13 migrant destination countries (the dependent variable in the model) out of 18 countries for which remittance data is available from Bangladesh for the period beginning in financial year 2002 and ending in the financial year 2013. We could not take the remaining 5 countries as data on migrant flows were not available from BMET (Bureau of Manpower, Employment, and Training). Nevertheless, we observe that on average remittance inflows from these 13 countries account for around 82% of total remittance inflows to Bangladesh over the period 2002-2013.

The explanatory variables in our gravity model of remittances are GDP per capita of migrant destination countries relative to Bangladesh, flight distance from Bangladesh to major destination airports, destination-wise stock of Bangladeshi migrants (estimated from, outbound migrants from Bangladesh), foreign exchange rate in migrant destination relative to Bangladesh, Consumer Price Index of destination countries relative to Bangladesh, unemployment rate of destination countries relative to Bangladesh, Credit by financial sector relative to Bangladesh, Output gap as percentage of GDP relative to Bangladesh, whether there is bilateral manpower export agreement (mou) between Bangladesh and destination countries (1 if yes, 0 otherwise), and whether the country is an oil exporter (oec) (1 if yes, 0 otherwise).

In short, this our study examines a number of important economic, demographic, and geographic variablesthat the literature on the gravity model of migration and remittances suggested. Furthermore, as suggested by Ahmed and Martinez Zarzoso (2015) we also considered including the cost of sending remittances in our gravity model but we had to drop it as we could not find such data before 2008. A list of the dependent variable and explanatoryvariables of the model is presented in Appendix-1.

We investigate two broad types of gravity model of remittances: (1) the baseline gravity model, and (2) the augmented gravity model. In the baseline gravity model, we examine the relationship between the remittances inflows to Bangladesh and the following variables: the size of GDP in migrant destination countries relative to remittance-receiving countries (lgpc), the distance between Bangladesh and migrant destinations (ldist), the number of Bangladeshi migrant working in destination countries (lmig) and foreign exchange rate between remittance sending countries and Bangladesh.

In accordance with the gravity model, it is assumed that countries with higher per capita GDP level will attract migrant workers from countries with lower per capita GDP because the wage earning potential is higher in countries with higher per capita income. Similarly, the greater is the number of migrant stock in migrant destinations, the more will

5 Remittance flows in this study mean remittance inflows through official channels such as banking channels but does not include unofficial remittance inflows such as those by hundi or by any other unofficial/illegal channels.

be the remittances sent to their home country. Regarding exchange rates, the more Taka Bangladeshi workers get with fewer foreign currencies, the more remittances they will send to Bangladesh. In contrast, the greater the distance between two countries is, the less likely will the level of remittance flows between the two countries because distance will discourage migration possibly for high cost of migration and sending remittances.

In the augmented gravity model, we incorporated the following variables: consumer prices (relp), unemployment (relu), credit offered by the financial system (relc) and output gap (opg)[6] as explanatory variables. We also considered two dummy variables such as whether any memorandum of understanding exists between migrant destination countries and Bangladesh (mou), and whether the countries migrants are working are exporters of oil (oec) because these variables may be positively related to remittances as well.

Limitations

The study on the gravity model of remittances is constrained by availability and quality of data. For instance, despite the importance of the stock of migrants as a major determinant of remittances, no such data is available. Because of its potentially important role in remittances we estimated it using a 6-year cumulative sum[7] for each year for 2002-2013 period. For the dummies such as mou and oec, we depended on information gathered from newspaper reports and other sources.

On the other hand, variables listed in the model do not necessarily exhaust the list of important determinants. Literature lists a host of other important variables that typically have important effects on remittances such as wage rates, the cost of migration in terms of travel cost and employment arrangement, the cost of sending remittances, and the role of access to networks of exchange houses, skill and education level of migrant workers, drawing arrangement and banking system in delivering remittances, just to mention a few. However, there is either no recorded panel data on these variables or there is insufficient data that makes use of these variables difficult and often impossible.

Estimation Methods

We apply several panel regression methods to estimate the gravity model of remittances. In particular, we applyapplied pooled ordinary least squares (OLS), fixed effects (FE), random effects (RE), Hausman-Taylor and Mundlak estimation approaches to panel data analysis. We would also test robustness of the model by inspecting a number of alternative specifications.

We estimate pooled OLS with corrections for heteroscedasticity. The estimated parameters

6 Output gap in migrant destination countries (opg) was calculated using Hodrick-Prescott filter.

7 The expected duration of stay of expatriate Bangladeshi migrant workers is 6 years calculated as a weighted average of the duration reported in the Survey on the Use of Remittances (SUR) 2013 published by Bangladesh Bureau of Statistics.

of pooled OLS regressionare consistent if we assume the explanatory variables and the unobserved fixed effects are uncorrelated. However, this assumption may not often hold and if we estimate parameters in that situation, the parameters may contain unobserved heterogeneity bias (Hsiao, 2008). The decision on whether pooled OLS or FE model is consistent may be made by running restricted F-test and Breuch and Pagan LM test.

The bias in estimates may remedied by fixed effects and random effects models that account for unobserved heterogeneity albeit in different ways. In fixed effects model, the unobserved fixed effects are eliminated and so the parameters estimated are consistent.

On the other hand, random effects model assume that the unobserved effects are random and accordingly these effects are subsumed in the error term. If the unobserved effects are in fact random, estimated parameters of random effects model are consistent. However, it is not possible know a priori whether random effects or fixed effects model is appropriate. To identify which of these two model produces more consistent estimates of parameters we may use Hausman test. The null hypothesis of Hausman test is that the random effects is more consistent. If we reject the null hypothesis in Hausman test, we may infer that the individual fixed effects are correlated with the regressors, and hence the estimates of random effects modelare consistent.

In contrast, if fixed effects model turns out to be consistent, we still have problem because the fixed effects estimator eliminate time invariant variables. To overcome this problem, Mundlak (1978) treat country-specific effects as a function of the mean of time-variant variables. Considering its usefulness, we estimate the regression using Mundlak approach as well.

In spite of consistency of estimates we still face the problem of endogeneity or reverse causality. Fortunately, Hausman and Taylor (1981) estimatiom method address this issue by relaxing the exogeneity assumption inherent in pooled, FE and RE models to allow some of the regressors to be endogenous. The Hausman-Taylor approach treats the means of the exogenous time-variant variables as instruments for the endogenous variables.

Finally, we also perform diagnostic tests to guard against autocorrelation and heteroscedeasticity problems by employing appropriate tests. We use robust standard errors in our gravity model of remittances.

IV. Empirical Results

As indicated in the previous section, we first estimate a benchmark gravity model of remittances considering typical gravity variables such as per capita GDP of migrant destination relative to Bangladesh, distance between Bangladesh and migrant destinations, migrant flows from Bangladesh to these countries, and exchange rate in these countries with Bangladesh. In our benchmark gravity model, we estimated both fixed and random effects and tested which of the models was consistent by applying Hausman test. (Table-4.1).

The estimated Chi-squared statistic was 2.70 which was significant at all conventional levels of significance and hence we failed to reject the null hypothesis that random effect

model was consistent. Estimated parameters of the random effects model under the baseline gravity model showed that lgpc, lmig, and fxr were significant at 1% level while ldist was insignificant at all conventional level of significance. The results conform to theoretical expectation regarding the sign and effect of lgpc, lmig and fxr on remittances except ldist which implies that ldist is insignificant although it has the expected negative sign.

Table-4.1: Regression Results of the Benchmark Gravity Model

Dependent Variable: irem				
	Fixed Effects Model		**Random Effects Model**	
Regressors	Coefficient	Standard Errors	Coefficient	Standard Errors
lgpc	2.02*	3.44	2.01*	0.31
ldist	-1.01	2.14	-0.82	1.14
lmig	0.43*	0.05	0.42*	0.05
fxr	-0,30*	0.10	-0.21*	0.07
Hausman Test	**Chi-squared Statitistic**		**p-value**	
	2.70		0.61	

On the other hand, in the augmented model (Table-2.2), in addition to those examined in the baseline model, we examined the effect of relative consumer prices, unemployment rate, credit availability, governance ranking, and output gap. Furthermore, we introduced two dummies such as the existence of bilateral manpower agreement and whether the country of destination is an oil exporting countries. Again, we ran both fixed and random effects model and Hausman test to decide upon which model was consistent. Like the baseline case, result of Hausman test suggested that random effect model was consistent in case of the augmented gravity model too. The significance of parameters in the baseline line sustained in the augmented model too. However, in addition output gap was found significant at 10% level although the rest of the variables showed insignificant coefficients. Between two dummies we introduced, only mou appears to be significant while oil exporting status of countries turned out to be insignificant. The significance of mou indicates government initiatives do play a positive role in remittance inflows from destination countries of Bangladeshi migrants.

The coefficient on lgpc is 2.1 which means 1% increase in relative GDP per capita in destination countries lead to 2.1% increase in remittance inflows. Similarly, 1% increase in migrant stock is associated with 0.43% increase in remittance inflows. These results conform to the expected result of the gravity model in that migrants are attracted to destination countries for the higher income level and corresponding higher wage level in destination countries. We could not get wage rates for the countries in our sample, and so we depend on relative GDP per capita as a proxy gravity variable for wage rate. However, these results are suggestive of importance of gravity variables in determining remittance inflows.

Table-4.2: Regression Results of the Augmented Gravity Model

Dependent Variable: irem				
	Fixed Effects Model		**Random Effects Model**	
Regressors	Coefficient	Standard Errors	Coefficient	Standard Errors
lgpc	2.01***	0.41	2.10***	.37
ldist	-1.03	2.10	-0.05	1.26
lmig	0.40***	0.07	0.37***	0.05
fxr	-0,30***	0.10	-0.27***	0.08
relp	-0.10	0.15	-0.08	0.14
relu	-0.08	0.33	-0.27	0,29
relc	-0.03	0.29	1.53	0.22
relr	-0,03	0.03	-0.03	0.02
opg	-0.002*	0.001	0.002	0.001
mou	2.43*	0.92	1.72**	0.77
oec			-0.97	1.29
Hausman Test	**Chi-squared Statistic**		**p-value**	
	6.95		0.64	

In addition, we wanted to see whether fluctuation in output as measured by output gap in destination countries had positive or negative effects on remittance flows. A significant (at 10% level) but negative coefficients on output gap in destination countries relative Bangladesh suggests that economic fluctuations in destination countries results in lower remittance inflows to Bangladesh. This finding is supportive of the essence of gravity model of remittances in that it indicates that stability in real GDP in destination countries matter more for remittances since it means stability in employment and wage in these countries as well.

On the other hand, none of the coefficients on ldist, and relp, relu, relc, and relr were found significant at even at 10% significance level meaning that distance between Bangladesh and destination countries, price level, unemployment rate, credit availability, and governance ranking of destination countries relative to Bangladesh in destination countries do not significantly affect remittance inflows to Bangladesh.

Interestingly, the coefficient on consumer prices in destination countries relative to Bangladesh has negative sign as expected although the parameter is insignificant. In general, the estimated fixed model in this study finds evidence in favor of most of the gravity variables that existing literature considers.

On the whole, it appears that the inclusion of additional macroeconomic variables improved the performance of the model in terms of explaining what determines remittance inflows to Bangladesh. Nevertheless, the model could be better specified and estimated if the data on

the following were available: Bangladeshi migrant stocks in destination countries, the cost of migration, the cost of sending remittances, migration policies in destination countries and the bilateral contractual relationships (memorandum of understanding, i.e., mou) on manpower exports between migrant destination countries and Bangladesh.

In order to check robustness of the model we also estimated the parameters by applying Mundlak and Hausman Taylor estimation methods. In general, results of our estimation with these methods (Appendices) support our estimation by random effects model that was suggested by Hausman tests we discussed earlier.

V. Summary and Conclusion

In this study we attempted to investigate whether the gravity model of remittances can explain remittance flows to Bangladesh. We examined traditional gravity variables such as migrant stock, distance, GDP per capita, and foreign exchange rate and found support evidence in favor the gravity variables in benchmark model except distance. In the augmented model, we incorporated additional variables that might potentially act as gravity variable, namely, the price level, unemployment rate, credit by the financial system, output gap, and governance ranking in destination countries relative to Bangladesh and existence of bilateral relation between migrant host countries and Bangladesh. Except output gap and bilateral agreements all other additional variables appear insignificant.

Our findings suggest that remittances are generally affected by both supply and demand for migrant labor as predicted by the gravity model. The economic conditions in destination countries appear to matter in hiring migrant workers as displayed in significant coefficients of unemployment rates and output gap in those countries. Rising unemployment in migrant destinations, particularly in the middle-east, may shrink employment (if not for household workers who are paid very low wages!) and wages and hence remittances in future. External economic shocks may transmit through migration and remittance channels to Bangladesh and destabilize macroeconomic stability from a disproportionate dependence on overseas employment and remittances for the external sector stability of Bangladesh. However, we think that a more in-depth analysis is required for making conclusive remarks on the link between unemployment in the destination countries and that in Bangladesh.

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Forecasting of VAR and ARIMA Based Exchange Rate of Bangladesh

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Abstract

This paper concentrates technical analysis to address stochastic and deterministic approach to forecast exchange rate of Bangladesh. Volatility clustering exchange rate of Bangladesh is market driven based on managed float. Vector auto regression (VAR) approach is used to determine the exchange rate in order to form rational expectation regarding exchange rate of Bangladesh. Technical analyses ranging from unit root to VAR have been used to forecast the monthly average exchange rate following new convention. SWAP and forward exchange rate will be determined taking into account absolute and comparative advantage and rational expectation. I have also applied auto regressive integrated moving average (ARIMA) model to forecast the exchange rate. Non seasonality in ARIMA predicted stable exchange rate for next six months (July-December, 2012), which is mostly close to actual rate. This exercise will help to forming rational expectation about exchange rate forecast from quantitative point of view.

Keywords: Central bank and policies**,** Exchange rate and forecasting and model application.

JEL classification: E58, F31 and F47

1. Introduction

Considering technical analysis like VAR and ARIMA investor can rationally forecast the exchange rate. Each observed variables scrupulous attention can establish the long run equilibrium relationship of exchange rate deviation. Technically robust forecasted exchange rate from the policy perspective will enhance the export and remittances with a balance in import. Proper exchange will stabilize the inflation with higher GDP growth. This paper observes that exchange rate in the short run may be deterministic which becoming stochastic in the long run. Apart from technical analysis further investigation addressing trade weighted inflation adjusted partner countries currency basket and all capital flows of balance of payments (BOP) may produce better exchange rate in Bangladesh.

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Monzur and Mansur (2009) examine the exchange rate policy in Bangladesh for the period 2000-08. Regime classification of the paper suggests that Bangladesh maintained a de facto managed floating regime by intervening in the foreign exchange market on a regular basis. This is at odds with the Bangladesh Bank's claim of maintaining de jure floating regime since end-May 2003. A high exchange rate pass-through is observed along with high market pressure during the period of expansionary monetary policy. Given the thin foreign exchange market and high pass-through effects, it appears difficult for Bangladesh to maintain a freely floating regime.

As the government has successfully achieved the macroeconomic stability, agent may rationally work for arriving and adjusting future time path of exchange rate using VAR and ARIMA. In the monetary frontier, the Nationalised Commercial Banks (NCBs) are hesitant to lend because of uncertainty, which resulting higher rate. Consequently the economy is experiencing with excess liquidity. On the demand side, the current account surplus attributed higher growth in Taka currency, advocating interest rates and money supply balancing. Excess liquidity can be absorbed through Reverse Repo and Bangladesh Bank Bill for maintaining balance in interest rate and exchange rate. It is hoped that collective actions taken by the banks and BB will deal the agency problems related to exchange rate smoothing investment and mobilizing savings. Operationally, this is how rotten apples can be segregated from good ones (A.K.N. Ahmed, former Governor, IBB Journal, Dec.1997).

Organization of the paper

Literature review is articulated in section-I. Section-II explains methodology. Section-III deals with VAR model variables from macroeconomic perspective in brief. Analyzing the VAR model and exchange rate forecasting are described in section-IV. Forecasting of volatility clustering exchange rate using ARIMA is depicted in Section-V. Conclusion is represented in Section-VI.

Section-I

Literature Review

Luetkepohl (2011) suggests that multivariate simultaneous equations models were used extensively for macro econometric analysis when Sims (1980) describes VAR models as alternatives. The model typically treats all variables as a priori endogenous. Sims' critique that the exogeneity assumptions for some of the variables in simultaneous equations models are ad hoc and often not backed by fully developed theories. Restrictions, including exogeneity of some of the variables, may be imposed on VAR model based on statistical procedures. VAR models are natural tools for forecasting. Their setup is such that current values of a set of variables are partly explained by past values of the variables involved. They can also be used for economic analysis, however, because they describe the joint generation mechanism of the variables involved. Structural VAR analysis attempts to

investigate structural economic hypotheses with the help of VAR models. Traditionally VAR models are designed for stationary variables without time trends. Trending behavior can be captured by including deterministic polynomial terms. In the 1980s the discoveries of the importance of stochastic trends in economic variables and the development of the concept of co-integration by Engle and Granger (1987) have shown that stochastic trends can also be captured by VAR model. If there are trends in some of the variables it may be desirable to separate the long-run relations from the short-run dynamics of the generation process of a set of variables. Vector error correction models offer a convenient framework for separating long run and short-run components of the data generation process (DGP). In the article specific issues related to trending variables will be mentioned necessarily. The advantage of levels VAR models over vector error correction models is that they can also be used if the co-integration structure is unknown. ARIMA models are, in theory, the most general form of models for forecasting a time series which can be made to be "stationary" by differencing (if required), perhaps in conjunction with nonlinear transformations such as logging or deflating (if required). An ARIMA model can be viewed as a "filter" that tries to separate the signal from the noise, and the signal is then extrapolated into the future to obtain forecasts.

It is attributed from anecdotal evidence, surveys on banks and financial institution transactions, business expectations, and empirical evidence there is insightful correlation between investment and real interest rate indicated by Rahman (1994). Basically economic cycle, seasonality and time lag on policy actions have greater impact on mapping different rates including tradable and non-tradable. Demand and supply as economic fundamentals is crucial to understand causal effect termed as rates and price.

Section-II

Methodology

Econometric analysis has been performed in this paper. Different economics, statistics and mathematical tools ranging from, unit root, hypothesis testing, Johansen co-integration test, impulse response function (IRF) and variance decomposition are tested in this article to form rational expectation. Forecasting of exchange rate using vector auto regression (VAR) and ARIMA is the fundamental attempt of this paper. In VAR appropriateness of the selected variables will produce robust forecasted exchange rate incorporating the variability comparing other econometric exercise. ARIMA model with autoregressive form and without seasonality treatment addresses the better forecast of Bangladesh exchange rate. These technical analyses of exchange rate will help forming rational expectation by the investors.

Section-III

VAR model variables from macroeconomic perspective

In our VAR finally model 1 four alternative variables have been acknowledged to get economic feedback and dynamic interrelationships. Other two models 2 and 3 did not provide better outcome. Without prior restriction the endogenous variables interaction

are checked in the UVAR with regular interval as the monthly data concern. All the macroeconomic variables export, import and remittances are the complementary variables of current account balance of BOP. As a result, the variables are co-integrated based on endogenity and reduced form equation and we cannot reject the null there is unit root. High t values minimum error of the VAR implies the model is significant with long run equilibrium relationship among variables. As central banking is an art we need to properly treat the individual variable to get desired outcome following time path. VAR exercises demonstrate that regressed value of the variables will reasonably contribute in forming rational expectation by the policy makers and other agents of the economy.

Model 1: exrate(X1) lnexport(X2) lnimport(X3) lnremit (X4) (Table 4)

Based on the estimated co-integrating vector (VAR) long-run equilibrium equation we can write following equations by OLS. In the equation u's are the stochastic error terms, called shocks, innovation or impulse in the description of VAR. Seemingly unrelated regression (SURE) technique is used to estimate the equation. Same number of lagged is included in the equation of endogenous variable of OLS estimation. Accordingly, each equation represents identical as well as efficient estimates.

$$exrate = \mathrm{a}o + \sum_{j=1}^{k} \mathrm{a1jX1t} - \mathrm{j} + \sum_{j=1}^{k} \mathrm{a2jX2t} - \mathrm{j} + \sum_{j=1}^{k} \mathrm{a3jX3t} - \mathrm{j} \sum_{j=1}^{k} \mathrm{a4jX4t} - \mathrm{j} + \mathrm{u1t}$$

$$lnexport = \phi o + \sum_{j=1}^{k} \phi \mathrm{1jX1t} - \mathrm{j} + \sum_{j=1}^{k} \phi \mathrm{2jX2t} - \mathrm{j} + \sum_{j=1}^{k} \phi \mathrm{3jX3t} - \mathrm{j} \sum_{j=1}^{k} \phi \mathrm{4jX4t} - \mathrm{j} + \mathrm{u2t}$$

$$lnimport = \alpha o + \sum_{j=1}^{k} \alpha \mathrm{1jX1t} - \mathrm{j} + \sum_{j=1}^{k} \alpha \mathrm{2jX2t} - \mathrm{j} + \sum_{j=1}^{k} \alpha \mathrm{3jX3t} - \mathrm{j} \sum_{j=1}^{k} \alpha \mathrm{4jX4t} - \mathrm{j} + \mathrm{u3t}$$

$$lnremit = \beta o + \sum_{j=1}^{k} \beta \mathrm{1iXjt} - \mathrm{j} + \sum_{j=1}^{k} \beta \mathrm{2jX2t} - \mathrm{j} + \sum_{j=1}^{k} \beta \mathrm{3jX3t} - \mathrm{j} \sum_{j=1}^{k} \beta \mathrm{4jX4t} - \mathrm{j} + \mathrm{u4t}$$

Model 2: lnexrate lnexport lnimport lnremit (not shown in the tabular form)

Model 3: exrate lnexport lnimport lnremit lnindpd- Estimates including lnindpd did not provide better result impacting other variables in the model. (not reported)

Standard error and t-statistics are showing in the first and third brackets incorporating 1 period lag (Table 4). Exchange rate coefficient 1.39 is more elastic by reason of volatility clustering. The elasticity of export is negative 0.83 percent. Import and remittance coefficient are also low in the identical form of VAR (Table 4). Remittance is less volatile and following stable path. Establishing of money changer, anti money laundering and other promotional activities is contributing the remittance growth rather only devaluation. In the VAR model imposing of common lag structure direct to reduction of degrees of freedom. Bearing this in mind VAR is tested with minimum lag. In the exercise we find minimum value of Akaike information criterion and Schwarz criterion. UVAR produces best forecasted outcome for inflation and exchange rate according to Habibur and Sayera, (2007) .Kamal et. Al(2013) paper adopts an econometric analysis of determinants of exchange rate for US Dollar in terms of Bangladeshi currency within the framework of monetary approach. Monthly data from January 1984 to April 2012 for Bangladesh relative to USA have been used to examine the long run and short run behaviour of BDT/USD exchange rate.

The paper finds that real exchange rate and the macroeconomic variables affecting real exchange rate forms a cointrigrating vector. Its observes that stock of money and increase in debt service burden results in a real depreciation of currency, while increasing foreign exchange reserve results in a real appreciation of currency. Moreover, Political instability has a significant negative effect on the value of domestic currency. In our stipulated VAR model incorporation of related variables in the model has contributed to forecast robust exchange rate. Export, import and remittances are the major variables of current account balance (CAB) of BOP. In VAR model incorporating of other variables like foreign direct investment (FDI) and medium and long term (MLT) loan are deterministic, which may not bring robust exchange rate forecast. The appreciation and depreciation of exchange rate in Bangladesh mainly depend on the export, import and remittance. The disequilibrium of exchange rate is corrected with the impact of these variables.

Section-IV

Analyzing the VAR model and exchange rate forecasting

Unit root test: We worked with each variable 60 monthly data sets starting from July 2007 to June 2012. It is crucially important to verify the data is stationary before advancing VAR estimations. In this regard Augmented Dickey-Fuller (ADF 1981), Phillips-Parron (PP 1988) and finally Kwiatkowski-Phillips-Schmidt-Shin (KPSS 1992) have been deployed. Test result demonstrated in (Table 1) and indicates that the variables under consideration are stationary in the first difference. Low p-value of variables supports this inference. All variable are I(1) with different significance level. For KPSS correlogram has also been checked for stationary. Consequently, we accept the null hypothesis (Ho) that the all observed variable has unit root and reject the alternative hypothesis (Ha) there is no unit root. In level most cases t value are less than critical values. So, we cannot reject the null. We accept I(1) process in the level and the data is non stationary. To support this basically we checked the correlogram with p values. If the other roots of the characteristic equation lie inside the unit circle that is, have a modulus (absolute value) less than one then the first difference of the process will be stationary.

Table 1. Result on Unit Root Test on stipulated Variables

	ADF		PP		KPSS	
Variables	With intercept	With trend plus intercept	With intercept	With trend plus intercept	With intercept	With trend plus intercept
exrate	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
lnexport	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
lnimport	I(1)	I(1)	I(1)	I(1)[b]	I(1)	I(1)[c]
lnremit	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
lnindpd	I(1)	I(1)[a]	I(1)	I(1)	I(1)	I(1)

a= 1% level significant; b=5% level significant; c=10% level significant

Notes: 1. All tests have been organized on the basis of 1%, 5% and 10% significance level using Econometric Views 5 package. 2. I(1) means non-stationary. 3. ADF and PP tests have been performed on the null hypothesis of unit root and KPSS test performed verifying correlogram as a diagnostic tool. 4. Lag lenth for ADF for monthly data are decided on the basis of Schwartz's information criteria (SIC). 5. Maximum bandwidth for PP and KPSS tests are based on Newey-West (1994).

Johansen co-integration test: Unrestricted co-integrated rank test pointed that the trace statistics is more than critical value and the p values is 0.0237 (Table 2). Trace test indicates 1 co-integration equation at 0.05 level. Maximum Eigenvalue with respect to hypothesis exhibits that Max-Eigen statistic is higher than critical value. This reject the hypothesis at the 0,05 level. Engle and Granger contributed that a linear combination of two or more non stationary series at different significant level may be stationary. In such case linear combination persists and the non stationary time series are said to be co-integrated. Long run equilibrium relation among the variables are persists (Table 2).

Table 2. Johansen Co-integration Test

Sample (adjusted): 2007M09 2012M06
Trend assumption: Linear deterministic trend
Series: EXRATE LNEXPORT LNIMPORT LNREMIT
Lags interval (in first differences): 1 to 1
Unrestricted Co-integration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.382390	51.15936	47.85613	0.0237
At most 1	0.246354	23.20924	29.79707	0.2359
At most 2	0.090945	6.804981	15.49471	0.6004
At most 3	0.021737	1.274676	3.841466	0.2589

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.382390	27.95013	27.58434	0.0449
At most 1	0.246354	16.40425	21.13162	0.2021
At most 2	0.090945	5.530306	14.26460	0.6739
At most 3	0.021737	1.274676	3.841466	0.2589

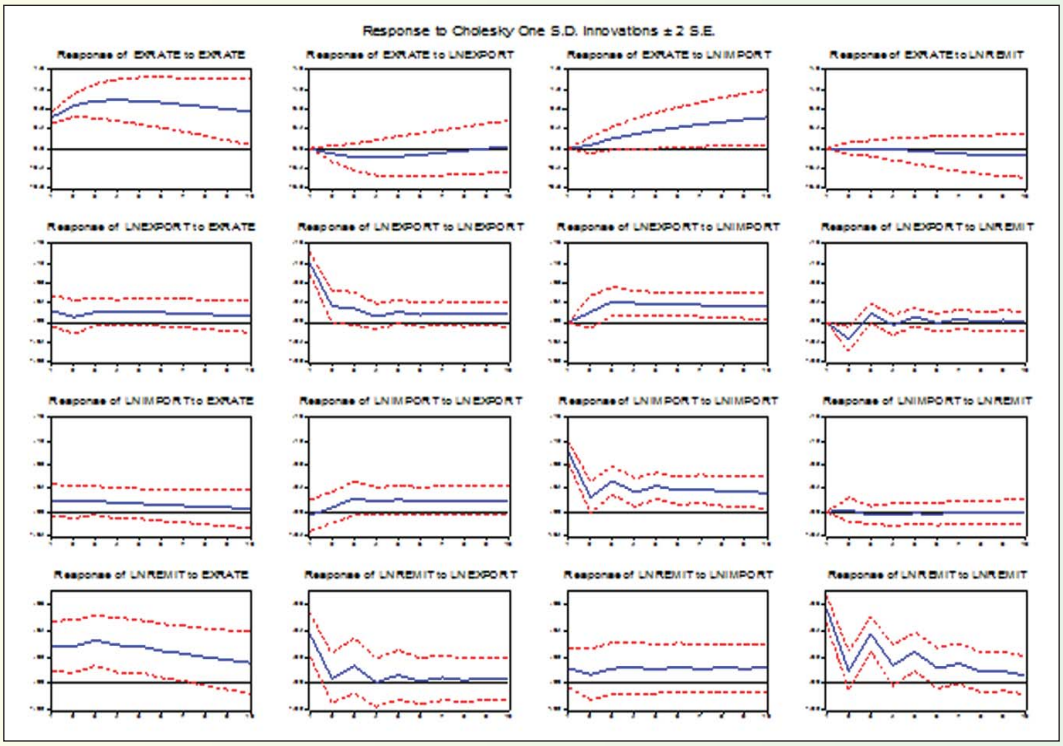
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Co-integrating Coefficients (normalized by b'*S11*b=I):				
EXRATE	LNEXPORT	LNIMPORT	LNREMIT	
-0.066626	-7.024374	7.750218	4.142108	
0.118591	-5.869347	3.925713	-3.465000	
0.022004	-3.035012	-4.481322	7.215239	
-0.350611	-0.144706	2.679728	0.474716	
Unrestricted Adjustment Coefficients (alpha):				
D(EXRATE)	0.132210	0.022115	-0.130731	0.055576
D(LNEXPORT)	0.042845	0.046887	0.011158	0.005904
D(LNIMPORT)	-0.031910	-0.013579	0.008130	0.011605
D(LNREMIT)	-0.014955	0.032746	-0.004321	0.004287

Empirical analysis of the test results:

***Exrate, lnexport, lnimport and lnremit impulse response*:** Impulse response of different variables can be observed in (Figure1). Individual variables innovation exhibits mostly positive response at different time horizon. The impulse of exchange rate (exrate) and import (lnimport), export (lnexport) and remittances (lnremit), import and export and remittance and export prolonged up to 9-month, 3-month, 1-month and 4-month respectively. Export and remittances impulse response is very close ending with 1 month. Devaluation of Taka immediately impacts the remittance. The combined impulse response can be found in (Figure 2) with different magnitude. In the group innovations exchange rate and import are prominent. In reality volatility occurs mainly due to increase in overall net short position of the banks. Banks excessive demand for foreign exchange payment initiates the volatility. In this occasion BB sale the foreign exchange for reducing volatility as the banks are allowed to maintain open foreign exchange position considering the capital of balance sheet. Moreover, all accounts of BOP are not fully convertible to bring the foreign credit or other loans by the banks or company. Inoue and Hamori (2004) empirically analyzed the sources of the exchange rate fluctuations in India using monthly data from January 1999 to February 2009 by deploying the structural VAR. The VAR model consists three variables i.e., the nominal exchange rate, the real exchange rate and the relative output of India and a foreign country. The empirical result advocates that real shocks were the main drivers of the fluctuations in real and nominal exchange rates, indicating that the central bank could not maintain the real exchange rate at its desired level over time.

Figure 1. Impulse response plot of exchange rate, export, import and remittance

Figure 2. Combined impulse response plot of exchange rate, export, import and remittance



Variance decomposition on variables: It measures the fluctuation of the observed variables that are responsible for own innovation and other variables in the gamut. Each column of

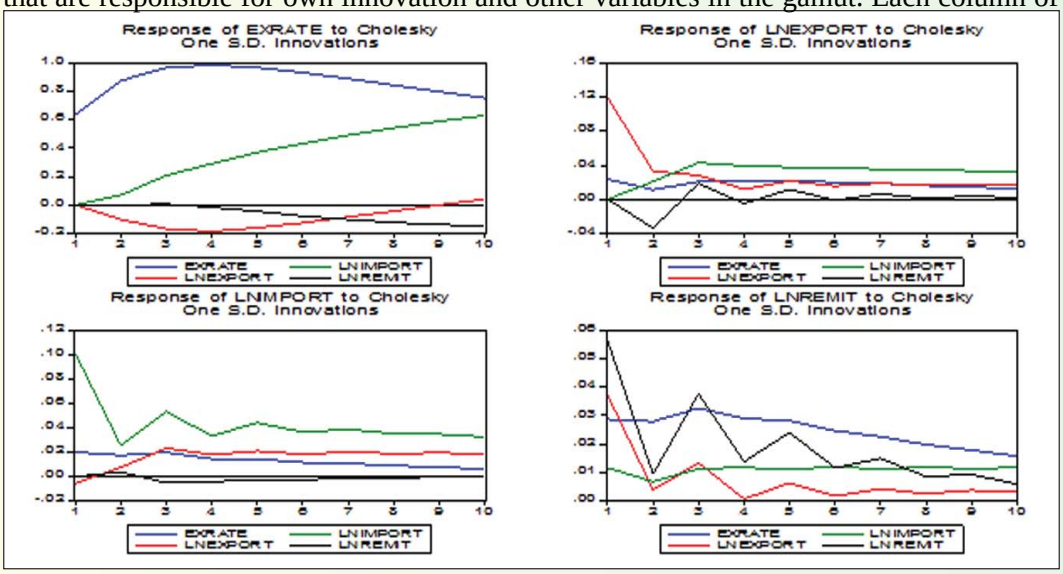


Table 3 summing up to 100 percent owing to percentage of forecast error variance of the innovations. The innovation predicts that own impulse has significant causal relationship as the variables are co-integrated. In the VAR estimate of model 1 own trend has significant impact on other variables. Variance decomposition of lnremit demonstrates that the share of exchange rate, export, import and remittances are 15 percent, 25 percent, 2.5 percent and 57.50 percent. Remittance has greater causality on exchange rate. Due to allowance short position in the foreign exchange market banks are governing from the negative position owing for borrowing considering mathematical and financial conventions. As a result, own innovation of the variable is persistent in the speed of adjustment (Table3**).** Overall ne short position US$ 100 million arise deducting overall long position (US$500 million) from overall short position (US$600 million) of banks. The import is not that much encouraged depending on exchange rate devaluation (Table3). Restriction of luxury items contributes in reduction of import.

Table 3. Variance Decomposition of exchange rate, export, import and remittance

Variance Decomposition of LNREMIT:					
Period	S.E.	EXRATE	LNEXPORT	LNIMPORT	LNREMIT
1	0.074232	14.98364	25.11464	2.450293	57.45143
2	0.080250	24.93988	21.71999	2.804236	50.53589
3	0.096091	28.91536	17.08647	3.345848	50.65231
4	0.101997	33.75897	15.16939	4.301009	46.77063
5	0.109251	36.08092	13.55246	4.750810	45.61581
6	0.113257	38.31229	12.63199	5.560966	43.49475
7	0.117049	39.58967	11.95621	6.099145	42.35498
8	0.119648	40.62891	11.48602	6.836234	41.04884
9	0.121898	41.27726	11.15878	7.439006	40.12496
10	0.123650	41.73331	10.91049	8.132011	39.22419
Cholesky Ordering: EXRATE LNEXPORT LNIMPORT LNREMIT					

Chen (2004) estimated structural VAR model using quarterly data of the USA, Canada, Germany, Japan and the UK ranging 1974:Q to 2002:Q4 by following Clarida and Gali (1994). His results indicate that the variance of real exchange rates can be attributed more to monetary shocks when the sample is extended. He also demonstrated using VAR model with long run annual data from 1989 to 1995 and observe that monetary shock can explain

nearly 50 percent of real exchange rate variance in the long run sample period.

Form VAR monthly average forecasted exrate for July, 2012= -4.137+1.389-0.828+0.692+0.016 = -2.868 percent growth over June, 2012 exrate (81.820)=79.474 (under-cast comparing actual 81.772 of July,2012). VAR analysis and forecasting imply that economy of Bangladesh observing interdependence relationship with co-integrating vector.

Table 4. Vector Auto-regression Estimates

Sample (adjusted): 2007M09 2012M06 Included observations: 58 after adjustments Standard errors in ( ) & t-statistics in [ ]				
	EXRATE	LNEXPORT	LNIMPORT	LNREMIT
EXRATE(-1)	1.388523	0.018870	0.014894	0.035631
	(0.13524)	(0.02595)	(0.02193)	(0.01583)
	[10.2673]	[0.72714]	[0.67909]	[2.25014]
EXRATE(-2)	-0.417071	-0.017989	-0.018268	-0.032349
	(0.13770)	(0.02642)	(0.02233)	(0.01612)
	[-3.02893]	[-0.68080]	[-0.81807]	[-2.00642]
LNEXPORT(-1)	-0.828058	0.475138	0.055381	-0.017667
	(0.79446)	(0.15245)	(0.12884)	(0.09302)
	[-1.04229]	[3.11669]	[0.42985]	[-0.18992]
LNEXPORT(-2)	0.158287	-0.086012	0.222114	-0.056987
	(0.78173)	(0.15001)	(0.12677)	(0.09153)
	[0.20248]	[-0.57339]	[1.75206]	[-0.62259]
LNIMPORT(-1)	0.691951	0.277288	0.243652	0.047716
	(0.82632)	(0.15856)	(0.13401)	(0.09675)
	[0.83739]	[1.74875]	[1.81822]	[0.49317]
LNIMPORT(-2)	1.154302	0.204655	0.450393	-0.004220
	(0.83697)	(0.16061)	(0.13573)	(0.09800)
	[1.37914]	[1.27425]	[3.31824]	[-0.04306]
LNREMIT(-1)	0.015826	-0.599238	0.064559	0.167395
	(1.11310)	(0.21359)	(0.18051)	(0.13033)
	[0.01422]	[-2.80549]	[0.35764]	[1.28437]

LNREMIT(-2)	-0.461698	0.697556	-0.085511	0.628051
	(1.09765)	(0.21063)	(0.17801)	(0.12852)
	[-0.42062]	[3.31177]	[-0.48038]	[4.88668]
C	-4.136890	0.042287	0.723505	1.375463
	(3.53478)	(0.67829)	(0.57324)	(0.41389)
	[-1.17034]	[0.06234]	[1.26213]	[3.32329]
R-squared	0.982097	0.806507	0.837311	0.847545
Adj. R-squared	0.979174	0.774917	0.810750	0.822655
Sum sq. resids	19.69457	0.725199	0.517958	0.270011
S.E. equation	0.633979	0.121655	0.102813	0.074232
F-statistic	335.9877	25.52992	31.52358	34.05084
Log likelihood	-50.97553	44.77239	54.53238	73.42390
Akaike AIC	2.068122	-1.233531	-1.570082	-2.221514
Schwarz SC	2.387846	-0.913807	-1.250358	-1.901790
Mean dependent	71.46851	7.325885	7.717088	6.784688
S.D. dependent	4.393063	0.256424	0.236337	0.176272
Determinant resid covariance (dof adj.)		1.84E-07		
Determinant resid covariance		9.37E-08		
Log likelihood		140.1116		
Akaike information criterion		-3.590056		
Schwarz criterion		-2.311160		

Section V

Forecasting of volatility clustering exchange rate using ARIMA

After analyzing mentioned test in classical manner we performed forecasting incorporating seasonal and non-seasonal factors apart from VAR. Following exchange rate own pace observed from VAR the auto regressive integrated moving average (ARIMA) model can be deployed for forecasting. ARIMA (1,0,0) is followed for getting forecasted exchange rate with the help of Minitab software. Non seasonality in ARIMA predicted stable exchange rate (Figure 3) for next six months (July-December, 2012), which is mostly close to actual rate. Six months seasonality demonstrated that there is surge in exchange rate from November to December, 2012 (Figure 4). Non-seasonal and seasonal forecasted value can be found in Table 5 and Table 6 respectively. Sayed (2004) and Banik (2013)

have pointed out many forecasting research have shown that the behaviour of exchange rate series cannot be modelled solely by linear time series model (e.g. regression model, AR(p), ARIMA(p,q) and others) because exchange rate nature is most complex(non-linear) and volatile. Therefore, developing a model for forecasting requires an iterative process of knowledge discovery, system improvement through data mining as well as error and trial experimentation. However, Bangladesh's foreign exchange market is limited and experiencing low arbitrage and speculation. For that reason conventional variance decomposition has absolute effect among variables. SWAP transaction based on comparative advantage and currency affluence works for reducing the volatility clustering exchange rate of Bangladesh. Autoregressive form in ARIMA exercise addresses the fixed type of recent exchange rate of Bangladesh. IT based real time settlement of exchange rate has reduced the use of seasonal treatment in ARIMA. Real time solution in exchange rate in Bangladesh has contributed to reduce the asymmetric information and moral hazard in creating volatility. Thus reduced volatility in exchange rate due to technological success has encouraged to use ARIMA (1,0,0) based exchange rate in Bangladesh.

Figure 3. Non seasonal monthly (average) forecasted exchange rate plot using ARIMA

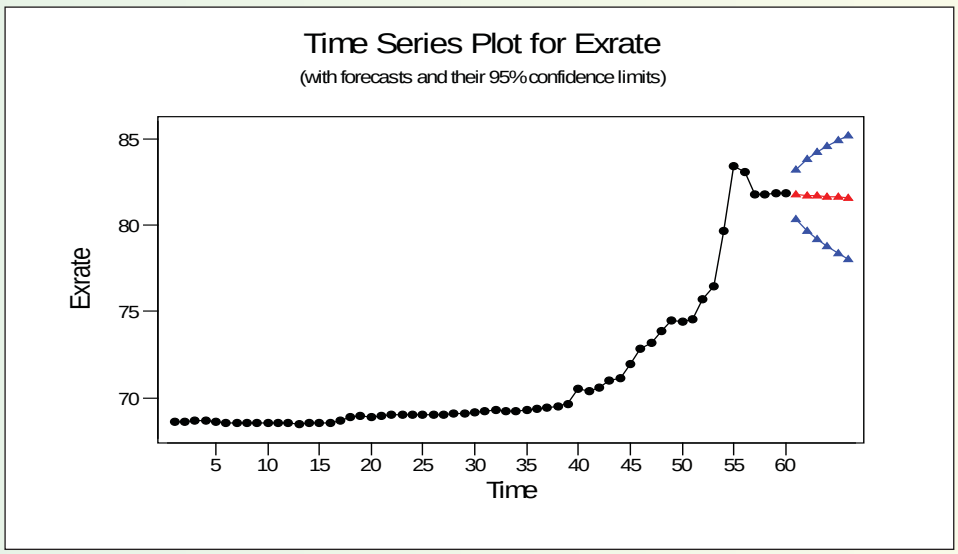


Figure 4. Forecasted monthly (average) exchange rate plot using ARIMA with seasonal treatment

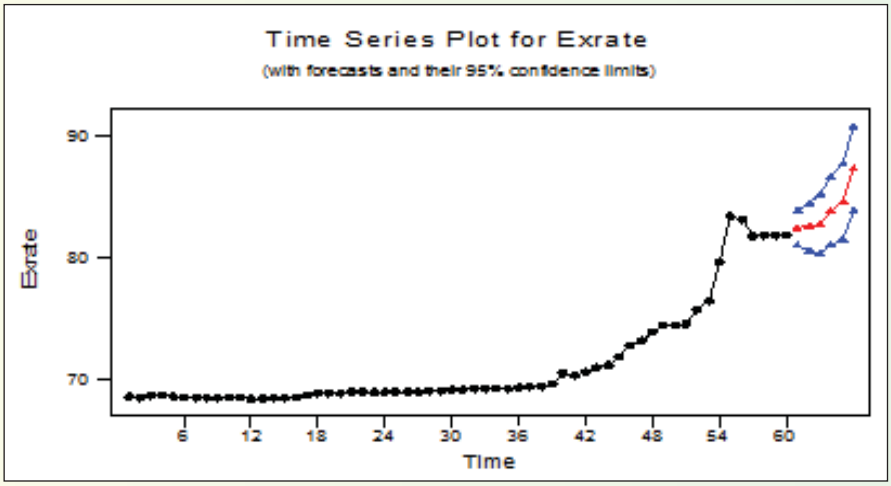


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Table- 5. 95% confidence level (with seasonali

(Taka/US$ exchange rate)

Month average	Forecast	Lower	Upper	Actual
July 12	82.432	81.0529	83.8112	81.7715
August 12	82.5303	80.5743	84.4863	81.5160
September 12	82.7584	80.3559	85.1610	81.7286
October 12	83.8163	81.0340	86.5985	81.3123
November 12	84.5619	81.4422	87.6815	
December 12	87.2837	83.8563	90.7111	

Table-6. 95% confidence level (without seasonality) (Taka/US$ exchange rate)

Month average	Forecast	Lower	Upper	Actual
July 12	81.7838	80.3281	83.2395	81.7715
August 12	81.7476	79.6894	83.8058	81.5160
September 12	81.7114	79.1912	84.2317	81.7286
October 12	81.6752	78.7658	84.5847	81.3123
November 12	81.6391	78.3869	84.8913	
December 12	81.6030	78.0412	85.1648	

In time series analysis a linear stochastic process has a unit root if I(d) in certain order of differentiation is stationary. AR(1,2…n) is a auto regressive process showing different order of differentiation identifying unit root of the system of equation. AR(1) represents the data which is stationary in 1st order differentiation. AR(2) refers 2nd order differentiation which is required to make the data stationary. Auto regressive process has been followed to fit the data in linear form for forecasting and forming rational expectation. This order is stationary as it is reached to zero. In this case we can accept the hypothesis or reject the alternative. The hypothesis is Auto correlation function is different from zero after first difference. We reject the hypothesis and find the stationary of the AR process of the data. ARIMA has 3 components. Auto Regressive - AR(1) is stationary in 1st order differentiation. Integrated- I(1) refers to the co integrated process. Moving Average MA(0) is a statistical extrapolation, and treatment is not applied (0). ARIMA (1,0,0) is followed for getting forecasted exchange rate in our study. To deal with reserve money (RM) the ARIMA (1,1,1) may be deployed. RM is basically deterministic variable.

Section VI

Conclusion

In our VAR model exercise the centrepiece is that observed variables are maintaining balanced interdependence relationships. Bangladesh exchange rate is primarily deterministic, which is Keynesians and finally normal trending market behaviour allowing classical from. Volatility of exchange rate is inherent due to economic cycle with arbitrage opportunity and speculation. In spite of this, IT based real time settlement in Bangladesh has reduced the asymmetric information and moral hazard in creating volatility in exchange rate. In our ARIMA model exercise we can forecast the monthly exchange rate in an autoregressive way incorporating steady exchange rate. VAR and ARIMA based technical exchange rate will address the deviation of real exchange rate taking into account information gap of demand and supply for balancing the inflation and GDP growth.

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Causes of Indian Rupee Depreciation and its Impact on Bangladesh Economy

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Abstract

The intention of this paper is to examine the impact of Indian Rupee depreciation on Bangladesh Economy. The empirical results obtained from OLS for the sample period from 2007:10 to 2013:10 show that Bangladesh's export to India is sensitive to India's Rupee depreciation. It is elastic implying that a 1% increase in India's Rupee will cause Bangladesh's export to India to decline by 2.7 percent. The relative output and the relative price variables are also very sensitive to Indian Rupee depreciation. Bangladesh import from India is insensitive to India and Bangladesh relative exchange rate changes. It is insensitive implying that 1% increase in India's Rupee will not cause any changes in Bangladesh's imports from India. However, Bangladesh's imports are very sensitive to the relative price level changes as evident from the estimated equation. The empirical results obtained from OLS show that Bangladesh consumer price index is insensitive to relative exchange rate changes though appear with the expected positive sign. However, India's consumer price index is highly significant with the expected positive sign implying that a 1% increase in the India's price will cause Bangladesh price level to increase by 0.76 percent.

Introduction

Increased globalization plays a significant role in transmitting economic shocks between countries. As international interdependence grows, changes in foreign economic policies exert greater influence on domestic economies. Therefore, the intention of this paper is to examine the impact of recent Indian Rupee Depreciation on Bangladesh economy. Bangladesh shares most of its border with India. Therefore, the level of integration between the two countries through trade is very active. India is Bangladesh's one of the major trading partners. Because, India's economy is large relative to Bangladesh, and because Bangladesh's capital markets are not entirely open, trade plays a significant role in the transmission of shocks. Therefore, the contagious effect of border and trade can

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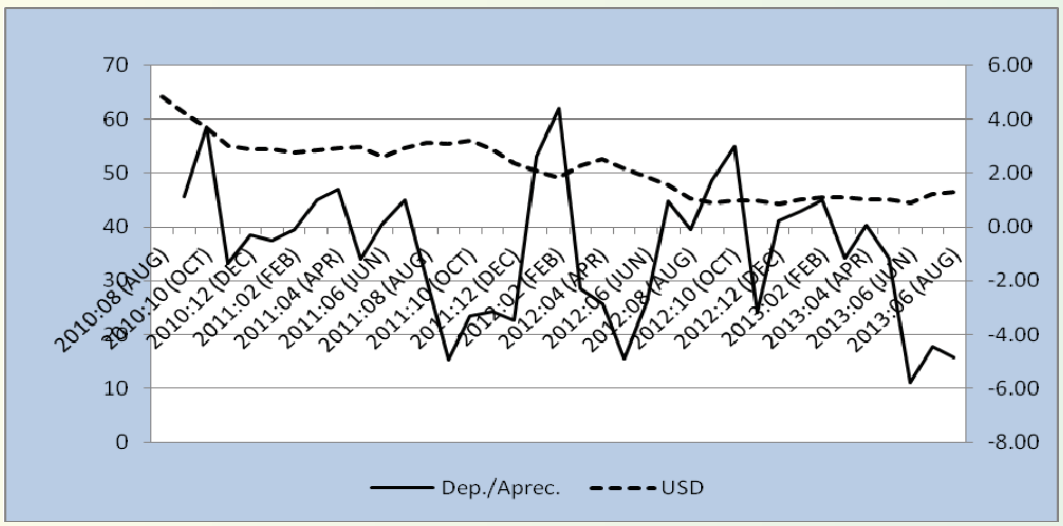
have a significant impact on domestic macroeconomic variables, particularly inflation and output. Indian authorities have reacted to the sharp depreciation by implementing a host of measures including higher interest rate through a liquidity squeeze on the banking system. The Reserve Bank of India (RBI) intervened in the market to protect the rupee by selling 2.72 billion of US dollar on June, 13 as against the purchase of only USD 469 million.

In this backdrop, an attempt has been made to assess the impact of Indian Rupee depreciation if any on Bangladesh economy. The plan of this study is as follows: after introduction in Section-1, causes of Indian Rupee depreciation is analyzed in section II. Section III deals with the related literature followed by an overview of Indian and Bangladesh trade relations in Section IV. Model specification, data, and model variables are discussed in Section V supported by the empirical results in Section VI and finally conclusions and recommendations in Section VII.

II. A Brief Analysis of Causes of Indian Rupee Depreciation

In India, in the backdrop of slackening growth, higher fiscal and current account deficits, higher CPI inflation coupled with the announcement effects of US Federal Reserve Bank to reverse its Quantitative easing (QE) bond purchases have translated into a rapid appreciation of the US dollar and depreciation of Rupee. It was also largely due to safe heaven flight of capital resulting from sell-offs in the financial markets. The sell-off had been made worse by new capital control introduced on August 14th in response to incipient signs of capital flight which reversed again in September 2013. The Indian government reduced the amount from 400% to 100% that Indian residents and firms can take out of the country.

Chart-1: Trends of India's Rupee Dollar Exchange Rate and its Appreciation and Depreciation



Source: Economic Trends, Bangladesh Bank.

Many foreign investors feared that India might freeze their funds too, as Malaysia did during its crisis in 1998 (The Economist, 24th August 2013). Despite the assurance of Indian authorities, the markets (stock and currency) keep sliding like other emerging and developing economies where most currencies have fallen 5-15% against the dollar in the past three months.

The RBI started easing monetary policy at the beginning of 2013, but last month (July 2013) saw a sudden change as the rupee was seen to be volatile (Table-1). Surprising the market expectations, the recent policy statement of RBI supported the stimulus program of the government that may likely to create downward pressure on Rupee. Unexpected increased in money supply causes the exchange rate to depreciate along with capital outflow on fears that foreign capital could flow back to the United States as the US economy improved.

Although, a sharp depreciation of the currency poses no immediate threat to the Indian government's solvency as the government has almost no foreign currency debts. The pain may be felt in other ways. Private firms that owe most of India's foreign debts would be under deep stress; particularly if the rupee drops further, some may go bust. Inflation will rise as the weak Rupee is fueling inflation and making imports more expensive as the country heavily relies on imports of crude oil, chemical, and some foodstuffs, which are priced in US dollars. In the short term nothing can do so, the market may overshoot intensely and appreciate after that. In the meantime, India's Rupee to a dollar may likely to find a new equilibrium with higher output and GDP growth.

Table-1: Major Monetary Policy Rates and Reserves Requirements

Effective Date	Bank Rate	Repo	Reverse	Cash Reserve Ratio	Marginal Standing Facility	Statutory Liquidity Ratio
20-09-2013	9.50	7.50	6.50	-	9.50	-
15-07-2013	10.25	-	-	-	10.25	-
3-05-2013	8.25	7.25	6.25	-	8.25	-
19-03-2013	8.50	7.50	6.50	-	8.50	-
9-02-2013	-	-	-	4.00	-	-
29-01-2013	8.75	7.75	6.75	-	8.75	-

Source: The Reserve Bank of India (RBI).

Table-2: Sale/Purchase of U.S. Dollar by the Reserve Bank of India

Month	Year	Net Purchase/ Sale of Foreign Currency ($ mil.)	Purchase (+) ($ mil.)	Sale (-) ($ mil.)
June	2013	-2,252.00	469.00	2,721.00
May	2013	-107.00	3,003.00	3,110.00
April	2013	518.00	3,298.00	2,780.00
March	2013	820.00	3,165.00	2,345.00
February	2013	-280.00	3,021.00	3,301.00
January	2013	-18.00	2,039.00	2,057.00

Source: RBI

Some may found it little convincing for Indian economy that the economy may get into a new equilibrium with higher output and employment aided by the increased exports, decreased imports helping domestic companies to reduce its large current account deficits. On the other hand, other policy makers are strongly skeptic about such a positive idea. They favored not to allow Rupee to lose its value too much as it might have serious adverse policy implications on India's commercial borrowings from the external sources as it results in increased debt repayments. The weakened rupee pushed international investors pulling money out of Indian shares and securities markets. The weak Rupee is fueling inflation and making imports more expensive as the country heavily relies on imports of crude oil, chemical, and some foodstuffs, which are priced in US dollars.

II.1 Recent Trends in Bangladesh Taka:

Bangladesh economy stood well with 6.13 percent real GDP growth in FY13 amid global economic weaknesses. Although in FY12, the country faced the challenges of rising inflation and balance of payments pressures stemming mainly from a sudden surge in oil imports. However, FY13 end with lower points-to-points CPI inflation and large surpluses in the balance of payments with all-time high foreign exchange reserves.

After a sudden drop in the par value of Taka against USD in early 2012, the Bangladeshi currency gradually gained its strength against US dollars since then (Chart-1). The reason could be attributed to current account surplus, higher exports and remittances, lower imports, comparatively higher interest rates and adequate foreign exchange reserves. Bangladesh Bank's intervention in the foreign exchange market also helped to stabilize the value of Taka. Bangladesh Bank has continued its interventions in the money market with a net purchase of USD 4.54 billion during FY13.

The REER based exchange rate reflecting the external competitiveness of Taka increased to Taka 79.07 per USD at end June 2013 from Taka 78.37 per USD at end-March 2013. The weighted average nominal exchange stood at 77.76 per USD at end June 2013 from Taka 78.58 per USD at end March 2013. Appreciation of REER based exchange rate indicates

some erosion of export competitiveness of Bangladesh currency in the international market during the period.

III. A Brief Review of the Literature

Many studies examine the impact of foreign monetary shocks on macroeconomic variables in developed and developing countries. Examples include Younus and Wheeler (2009), Amuedo-Dorantes and Wheeler (2001), Cushman and Zha (1997), Mixon, Pratt, and Wallace (1979), Selvor and Round (1996), and Sheehan (1992).

Younus and Wheeler (2009) examine the impact of domestic and foreign monetary shocks on Bangladesh's major economic aggregates. In the context of a semi-global economy, the conduct of monetary policy becomes increasingly more difficult as globalization proceeds. It becomes necessary to examine the impact of changes in relevant 'foreign' variables (e.g., interest rate, money supply, exchange rate) while formulating domestic monetary policy. The empirical results of the present analysis show that innovations to foreign money supply have significant impacts on Bangladesh's real exchange rate, interest rate, and output.

Amuedo-Dorantes and Wheeler (2001) examined the impact of the European Union (EU) on Spanish economic activity during the period from 1987 to 1997. They employ monthly data to estimate the impulse response functions and variance decompositions derived from a near vector autoregressive (NVAR) model. All techniques support the hypothesis that the European Union's income and prices had a strong influence on Spanish income and price variables.

Hoffmaister, Roldos, and Wickman (1997) examine the sources of macroeconomic fluctuations, especially output, and prices empirically, in Sub-Saharan African countries. They divide the countries into CFA franc countries (where exchange rates are pegged vis-à-vis to the French franc) and non-CFA franc countries (where exchange rate can frequently adjust). A five variable (output, real exchange rate, price level, world interest rate, and terms of trade) structural vector autoregressive (SVAR) model is used to derive variance decompositions and impulse response functions. Variance decompositions and impulse response functions show that the sources of output fluctuations in Sub-Saharan African countries are mainly due to the domestic supply shocks. External sectors also have some impact on the domestic output, prices, and the real exchange rate more in CFA franc countries than non-CFA franc countries.

In the CFA-franc countries, sixty percent of price fluctuations are due to demand shocks while twenty percent of price changes are due to domestic supply and external shocks. In the non-CFA-franc countries, eighty-five percent of fluctuations of prices are due to demand shocks. Due to favorable terms of trade shock, the price level declines temporarily and then quickly revert to its original level (Hoffmaister, Roldos, and Wickman, 1997, p.20). An examination of differences in economic structure across the countries does not appear to have a significant impact on the differences in macroeconomic fluctuations. However, differences in exchange rate regimes turn out to have major effects on the macroeconomic changes.

Cushman and Zha (1997) examine monetary policy shocks in Canada by using a structural vector autoregression (SVAR) model with monthly data from 1974 to 1993. Variables used are: the U.S. dollar price of Canadian currency, a monetary aggregate (M1), three-month Treasury bill rate, consumer price index, industrial production, total exports to the U.S., and total imports from the US, US industrial production, U.S. consumer price index, the U.S. Federal Funds rate, and the world total exports commodity price index in U.S. dollars. All variables are in logarithmic form except for the interest rates. The results from contemporaneous coefficients show that all the variables in the money demand and money supply equations are significant with the expected sign except for the foreign interest rates. The estimated results of the information market variables are significant except for domestic (Canada) and U.S. industrial production, the foreign interest rate, and world commodity price index of exports.

Selvor and Round (1996) examine to the what extent Japanese business cycles transmitted to Australia over the period from 1961.1 to 1994.4. Japan is the major trading partner of Australia. Japan contributes twenty-five percent (25 percent) of Australian exports to Japan and receives twenty percent (20 percent) of imports from Japan. Impulse response functions estimated from the VAR show that innovation to Japan's GNP has a significant positive impact on Australian GDP. US GDP also has an important positive impact on the Australian GDP, which is twice as large as the impact of Japanese GNP. However, Australian GDP does not have any significant impact on the Japanese GNP.

Sheehan (1992) conducted a study to examine the effects of the monetary policy of the G-7 countries, Switzerland, and the U.S. on the monetary policy of the G-7 countries and Switzerland. He found that the G-7 countries were unsuccessful in influencing money growth of other G-7 economies. U.S. money growth, domestic inflation and real domestic output have significant impacts on France, Germany, Italy, Japan, United Kingdom and Switzerland's money growth.

Mixon, Pratt and Wallace (1979) separate the exchange rate regimes as fixed, transition, and flexible exchange rate, The fixed rate period is 1962.I to 1970.IV, the transition regime is from 1971.I to 1974.III and the flexible exchange rate regime are from 1974.IV to 1977. III. The U.K. nominal GDP on U.S. money supply, a trend variable, and a set of dummy variables for different exchange rate regimes and seasonal dummy variables. An F-test fails to reject the hypothesis that U.S. money supply has no effect on U.K. income during a fixed exchange rate period. The U.S. money supply has a positive impact on U.K. income in both the transition and flexible exchange rate periods. The differences in the results, as noted by Mixon (1992), are due to differences in the exchange rate regimes.

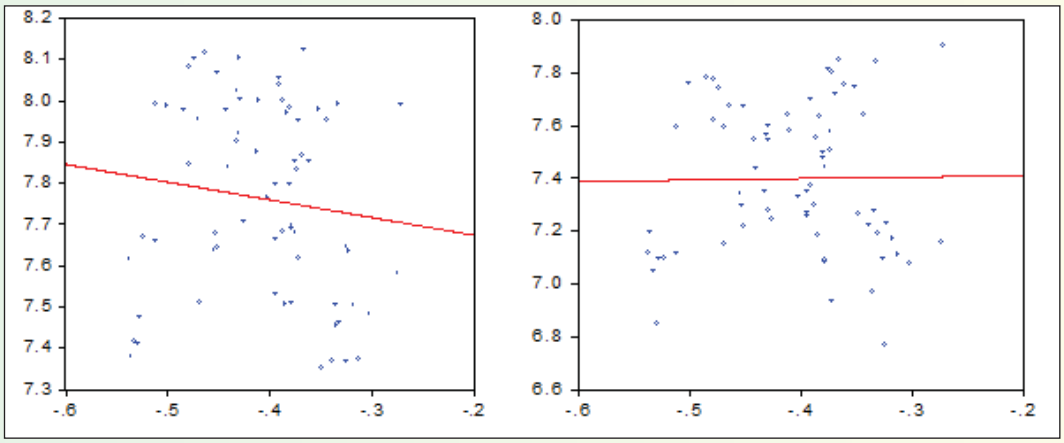
IV. An Overview of India and Bangladesh Trade relationship

India is Bangladesh's second largest source of imports comprising around 14 percent of total imports, much of it being cotton and fabrics used in the manufacture of apparels for exports, although a minor export destination (less than 4 percent of total exports). The impact of Indian Rupee depreciation on Bangladesh's external trade competitiveness is, therefore, a significant policy concern.

IV.1 Impact on Trade Balance

India is the second largest trading partner of Bangladesh. In FY'13, Bangladesh exported goods amounting of about USD 564 million to India while imported of about USD 4,777 million. Due to Rupee depreciation, Bangladesh trade balance with India may deteriorate as increased export competitiveness of India relative to Bangladesh is likely to have an adverse impact on Bangladesh's exports to India.

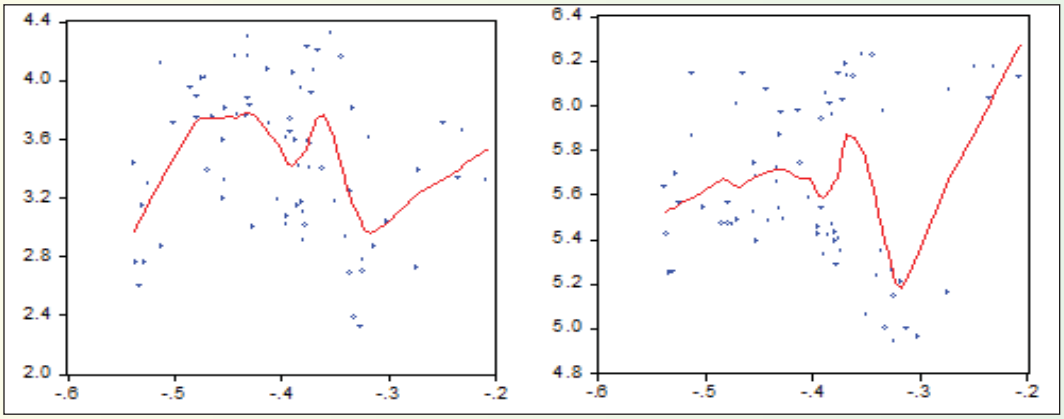
Chart 2: log of relative exchange rate vs. Bangladesh export (left) to and import (right) from India



On the other hand, lower import cost would increase imports from India. A commodity wise analysis shows that top five exportable items of Bangladesh to India are fruits, precious metals, iron and steel, jute goods and raw jute and vegetable oils. However, it is worth noting that none of these commodities are the major products for Bangladesh to export. On the other hand, on Bangladesh import payments, India placed second after China for the imports, e.g., cotton, cereals, vehicles, and nuclear reactors. Bangladesh imports raw cotton from India, which is used as inputs for the RMG sector.

A linear regression line of the above scatter diagrams shows that Bangladesh exports to India (left) have a negative relationship with the relative exchange rate changes while the relationship is positive with imports. This is may be because a fall in Rupee would make imports costlier for India thereby Bangladesh exports of the major commodities to India are expected to decrease to some extent. In fact during July-September, 2013, raw jute exports are reduced by 55.87% in volume and 52.96% in value which is one of the major export goods to India. Jute products also faced hit from Rupee depreciation. An empirical analysis of Bangladesh's export to India from the sample period October 2007 to October 2013 revealed that Bangladesh exports to India are very sensitive to relative exchange rate changes. This implies that if the relative exchange rate increases by 1% that would cause Bangladesh's export to India to declined by 2.87 percent.

Chart 3: log of relative exchange rate vs. Bangladesh export (left) to and import (right) from India (With nearest neighbor fit)

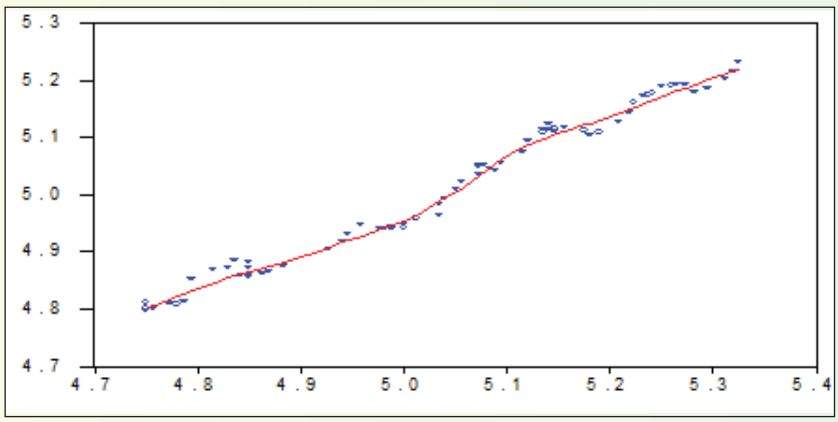


The actual data during July-September, 2013 show that Bangladesh export shipments to India fall by 29.42 (y-o-y) percent (Table-1) while during the same quarter Bangladesh total export shipment to world increased by 21.24 percent implying that it is may be due to country-specific factors such as India's Rupee depreciation that may have adverse impact on Bangladesh exports to India.

IV.2 Impact on inflation

The point to point WPI Inflation of India increased from 4.70% on May,13 to 7.00% on October,13. Bangladesh is a net importer in the trade relationship between India and Bangladesh. Therefore, inflation may decline in the short run due to lower import cost of consumer goods as a result of the appreciation of Taka and depreciation of Rupee.

Chart-4: log of India's and Bangladesh CPI inflation



From the above linear regression line of scatter diagram estimated for the same sample period shows that Bangladesh consumer price index would increase due to changes in Bangladesh and India's relative exchange rate. An estimated coefficient between India's

consumer price levels with Bangladesh consumer price level shows that a 1% increase in the India's price level will cause Bangladesh price level to rise by 0.76 percent through import channel.

Table-3: Average monthly export of Bangladesh and India, January-September, 2013

						As % of Total Export	
HS Code		**Bangladesh**		**India**		**Bangladesh**	**India**
62	**Woven Garments**	**Average Monthly Export (USD MM)**	**As % of Category Export**	**Average Monthly Export (USD MM)**	**As % of Category Export**	**39.9%**	**2.6%**
	USA	309.04	32.5%	154.11	23.4%		
	Germany	134.90	14.2%	41.63	6.3%		
	UK	91.42	9.6%	66.97	10.2%		
	Spain	45.73	4.8%	28.65	4.4%		
	Canada	42.52	4.5%	10.36	1.6%		
61	**Knitwear**					**41.1%**	**2.1%**
	Germany	215.53	22.0%	46.60	8.9%		
	UK	109.77	11.2%	64.85	12.3%		
	USA	105.62	10.8%	119.63	22.8%		
	France	77.25	7.9%	28.41	5.4%		
	Spain	69.04	7.0%	15.20	2.9%		
63	**Other Made Textile Articles**					**3.0%**	**1.4%**
	USA	11.28	16.0%	169.85	48.0%		
	Germany	6.27	8.9%	21.97	6.2%		
	India	6.01	8.5%	-	-		
	UK	5.83	8.3%	21.78	6.2%		
	Canada	4.31	6.1%	8.82	2.5%		
53	**Raw Jute & Jute Goods**					**2.3%**	**0.1%**
	Turkey	14.92	26.9%	0.29	1.2%		
	China	7.74	14.0%	5.10	21.5%		
	Iran	6.40	11.5%	0.15	0.6%		
	India	4.54	8.2%	-	-		
	Pakistan	3.52	6.3%	0.02	0.1%		
03	**Frozen Foods**					**2.7%**	**1.4%**
	Belgium	10.28	16.0%	9.86	2.8%		
	Netherlands	9.99	15.5%	3.55	1.0%		
	Germany	8.18	12.7%	2.08	0.6%		
	USA	7.30	11.4%	104.28	29.5%		
	UK	7.29	11.3%	9.95	2.8%		

Source: BRAC EPL, Stock Brokerage Ltd.

IV.3 Export competitiveness of India and Bangladesh

Although export competitiveness of India following Rupee depreciation will increase as compared to Bangladesh, it may not have a substantial impact on Bangladesh total exports if economic and political stability prevails in the country. According to World Trade Organization (WTO) database, Bangladesh ranked 3rd on textile and apparel exports after China and Italy. Bangladesh total amounts of exports receipts from the world on clothing was USD 19.95 bn in 2012. On the other hand, India ranked 7th on textile and apparel exports. The total export amount was USD 13.83 bn in 2012. Table-3 shows major export commodities of Bangladesh and % share of Bangladesh and India's exports in these commodities.

Table-4: Exports of Clothing in the World Market (USD at current prices)

Rank	Country	USD in MM	% share of world export
1	China	159,613.7	37.76
2	Italy	22,147.5	5.24
3	Bangladesh	19,948.3	4.72
4	Germany	17,574.7	4.16
5	Turkey	14,289.6	3.38
6	Viet Nam	14,068.3	3.33
7	India	13,832.7	3.27
8	Others	161,210.6	38.14
	World	422,685.6	100.00

Source: World Trade Organization (WTO)

IV.4 Impact on Import

With respect to import payments of Bangladesh, India placed second after China for the commodities, e.g., cotton, cereals, vehicles, nuclear reactors, etc. Bangladesh imports raw cotton from India, which is used as intermediate goods for the garments industries.

Top 5 commodities of Export Shipments, 2012-13			Top 5 commodities of Import Payments, 2012-13		
Items	**Value in million USD**	**%**	**Items**	**Value in million USD**	**%**
Woven garments	11039.9	40.85%	Capital Goods	5758.8	16.90%
Knitwear	10475.9	38.76%	POL (refined)	3642.0	10.69%
Jute goods	800.7	2.96%	Textile and articles thereof	3273.0	9.60%
Home textile	791.5	2.93%	Iron, steel and other base metals 2334.7	6.85%	

Shrimps	454.9	1.68%	Raw cotton	2005.1	5.88%
Others	3464.5	Others	17070.0		
Total	27027.36		Total	34083.6	

IV.5 Impact on other BOP flows

As far as other flows from India are concerned such as remittances, private capital outflows, bilateral grant, loans, the stock of debt, it is revealed that the amount is not very significant to have an impact on BOP. Remittances from India are on average $3^{1/2}$ percent of total remittances and bilateral loans and grants in FY13 was USD172 million while the stock of debt was USD83 million. Vulnerability from private capital outflows will not be significant as Bangladesh has a relatively closed capital account.

V. Data Analysis, Model Specification, Model variables, Methodology

To assess the impact of Indian Rupee depreciation on export, import, and the price level of Bangladesh an attempt has been made to estimate three models using monthly data for the sample period from 2007: 10 to 2013:12. The log of real exports, real imports, and the price level of Bangladesh are used as dependent variables while the bilateral exchange rate of India and Bangladesh has been used as a proxy for the relative exchange rate variable. The price level of India and Bangladesh are used to calculate the relative price variable, the industrial production index of India and Bangladesh are used to calculate the relative income variable.

Model Variables

Model-1: Dependent Variable: Log of BD export to India

Log_y=log of the industrial production index.
Log_e=log of the relative exchange rate.
Log_p=log of the relative price level.

Model-2: Dependent Variable: Log of BD import from India

Log_y=log of industrial production index
Log_e=log of relative exchange rate
Log_p=log of the relative price level.

Model-3: Dependent variable: log of price level_BD

Log_y=log of industrial production index of India and Bangladesh
Log_e=log of relative exchange rate between India and Bangladesh
Log_p=log of relative price level between India and Bangladesh(CPI)
Log_m=log of imports of Bangladesh from India
Log_p_India=log of India's price level
Log_p_BD= log of Bangladesh's price level

V.I Data Analysis

V.I.1 Stationary of the Time Series Data

The empirical analysis involves some steps. The finding that many time series macro variables may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Non-stationarity in Time Series (TS) arises due to the presence of trends in the data which is stochastic in nature (random walk process) and it confirms that the data has a unit root process. Any regression results with non-stationary TS provide spurious relationships between variables and therefore, provide misleading implications of the relationship.

V.I.2 Unit Root Test Results

To see whether the variables included in the model are non-stationary a series of Unit Root Tests are performed with time trend and intercept. The estimated results using Augmented Dickey-Fuller (1979) and Phillips-Perron (1998) tests show that the null hypothesis, $H_{0,}$ (has a unit root) cannot be rejected for all the variables have been performed. According to the ADF and PP tests, Log of the relative exchange rate, a log of relative price variable and a log of industrial production index, a log of Bangladesh real exports, a log of real imports, a log of Bangladesh and Indian price level have unit root in levels, while they are stationary in the first differences. An Ordinary Least Square (OLS) method is used to estimate the models. The first difference of each variable is used to avoid spurious relationship between the dependent and independent variables.

Table V.1: ADF and PP Tests for Unit Root

Variables	ADF	PP	Variables	ADF	PP
Log_y	-1.56	-3.02***	Δ Log_y	-9.21***	-4.26***
Log_e	-2.10	-1.65	Δ Log_e	-5.76***	-5.73***
Log_p	-0.80	-1.45	Δ Log_p	-3.73***	-10.37***
Log_M	-1.84	-2.42	Δ Log_M	-9.80***	-9.89***
Log_p_India	-0.74	-1.74	Δ Log_p_India	-5.33***	-3.96***
Log_X	-2.28	-1.80	ΔLog_X	-9.21***	-4.96***
Log_p_BD	0.94	-0.02	ΔLog_p_BD	-5.83***	7.14***

*** implies significant at the 1 percent level.

V.II Empirical Results

V.II.1 Impact on Exports

The empirical results obtained from OLS show that Bangladesh's export to India is sensitive to India's Rupee depreciation. It is elastic implying that a 1% increase in India's Rupee will cause Bangladesh's export to India to decline by 2.15 percent. The relative output and the relative price variables appear to be insensitive to Indian Rupee depreciation. The statistically insignificant coefficient for the price level of India compared to Bangladesh implies that a 1% increase in the relative price level of India does not have any impact on

Bangladesh export to India. On the other hand, industrial production index as proxies by output show that a 1% increase in the India's output compared to Bangladesh will not have any impact on Bangladesh export to India. The adjusted R^2 is quite high implying the model is a good fit. The Durbin-Watson shows that there is no first-order autocorrelation present in the model. The Q-statistics also shows that the residuals are white noise implying no higher order autocorrelation present in the model.

Model-1: Dependent Variable: log of BD export to India		
$\Delta lnBD\_Export\_India = \beta_0 + \Delta\beta_1 Log\_e + \Delta\beta_2 Log\_y + \Delta\beta_3 Log\_p + \varepsilon t$		
Variable	Co- efficient	T-value
D(Log_e)	-2.15	0.05**
D(Log_y)	-0.17	0.77
D(Log_p)	-2.93	0.28
c	0.03	0.10*
$AdjR^2$ 0.51		
DW 2.05		

Note:** implies significant at the 5% level. * implies significant at the 10% level

V.II.2. Impact on Imports

The empirical results obtained from OLS show that Bangladesh import from India is insensitive to India's Rupee depreciation. However, the impact of the relative price on the Bangladesh imports from india appear significant with the expected negative sign. The significant and negative coefficients implies that a 1% increase in the relative price of India compared with Bangladesh will reduce Bangladesh import from India by 4.01%.

Model-2: Dependent Variable: log of BD import from India		
$\Delta \ln BD\_Import\_India = \beta_0 + \Delta\beta_1 Log\_e + \Delta\beta_2 Log\_y + \Delta\beta_3 Log\_p + \varepsilon t$		
Variable	Co efficient	P-Value.
D(Log_e)	0.07	0.90
D(Log_y)	-0.07	0.78
D(Log_p)	-4.01	0.01***
c	0.02	0.15
AdjR2	0.07	
DW	1.99	

Note:*** implies significant at the 1% level

V.II.3. Impact on the Price level

Model-3: Dependent variable: log of price level_BD		
$\Delta lnBD_{Price} = \beta_0 + \Delta\beta_1 Log_e + \Delta\beta_2 Log_y + \Delta\beta_3 Log_p + \Delta\beta_4 Log_{p_{India}} + \varepsilon t$		
Variable	Co efficient	T-value
D(Log_p_India)	0.31	0.02**
D(Log_e)	0.03	0.28
D(Log_M)	0.01	0.07**
D(Log_y)	-0.01	0.75
c	0.004	0.08**
AdjR2	0.23	
DW	1.99	

Note:*** implies significant at the 1% level

Log_y=log of industrial production index of India and Bangladesh

Empirical results obtained from OLS show that Bangladesh consumer price index is insensitive to relative exchange rate changes though appear with the expected positive sign. However, India's consumer price index is highly significant with the expected positive sign implying that a 1% increase in the India's price will cause Bangladesh price level to rise by 0.31 percent. The coefficient of import also appears significant at the 10% level. The significant and positive coefficient implies that 1% increase in the Bangladesh import from India will increase inflation in Bangladesh.

VI. Conclusion:

Empirical analysis shows the existence of elastic demand of BD's export to India on changes in the relative exchange rate (depreciation) with a positive coefficient of 2.15, on the other hand, an estimate of BD's import demand (from India) on changes in the relative exchange rate (depreciation) shows a statistically insignificant coefficient though with the positive sign. However, actual data shows that during the period of sharp depreciation of Indian rupee relative to BDT (May-September 2013) imports payments of BD from India posted a very marginal increase of only 11 million USD (on quarter to quarter basis). Thus, econometric estimation seems to support the trend of actual data. There are sensible arguments to think that this quantitative result may be valid for a very short term or near term.

In the medium term however sudden upsurge of enormous global demand for different Indian products including cotton, RMG, textiles, edible oil, and fish feed (due to depreciation of Indian Rupee) may contribute to higher local prices of these products in India due to sudden demand pressure; and also Indian's limitation in enhancing its export supply in immediate term to respond this higher global demand will contribute to higher local prices.

In this situation like other countries, BD's import from India would expect to fall in the medium term followed by a gradual increase in import from India in the long run. In fact,

supply rigidity due to the nature of export items that mostly depend on agricultural raw materials such as cotton, oil seeds, fruits and other imported raw materials Indian producers may adjust the quantity of export supply slowly with somewhat higher local prices. In this way, the higher price level in India may transmit to the domestic price level of Bangladesh through import channel. However, the net results would depend on the relative exchange rate changes and the price level changes.

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An Evaluation of Determinants of Bank Selection by Educated Age Group Population – A Case Study of Private Commercial Banks in Dhaka City

Akim Rahman, Ph.D

Abstract

This study evaluates major factors of bank selection by educated young cohort people of Bangladesh to be bank customers. It is based on survey outcome of a mixed of 300 students & employees in diverse academic disciplines & background who are customers of private commercial bank(s) located in Dhaka City. The findings of the study reveal that the most important variables influencing customers' choices are digital banking facilities, profit rate and the third is the location of branches. Study findings further show that digital banking places first and bank environment places last when it comes choosing bank(s) for banking services. Mobile notifications of banking transactions and bKash services have dominated all digital facilities used by banks. The study bridges the existing gap in banking literature through identifying the important bank selection determining factors. It then concludes with some policy implications which are expected to have an impact on marketing efforts of private commercial banks (PCBs) in Bangladesh.

Keyword(s): e-banking, IT, Internet, ICT innovation, ATM

Introduction

The trend towards globalization has introduced many changes in the economic and business environment all over the world. Technological advancement, particularly information communication technology (ICT) innovations and its utilizations have significantly dominated the globalized economy (Charles, 2010). Similar resources and its utilization in various magnitudes are governing today's economic growth of many countries. Bangladesh is no exception to these changes and almost all industries including banking sector is being benefitted by this trend.

With this prospect and to be cost-effective & comparative, the banking sector of Bangladesh has undergone considerable changes since the time government announced its policy to privatizing commercial banks (Chowdhury, 2009; Al-Amin, 2010). This was started with privatization of few state-owned commercial banks and then induction of new ones from private sector to establish a market-based banking system (Akhtar, 2002). In this progression, since after the initial efforts, banks have become competitive within its own domain of financial system attracting its customers by providing various innovative

banking services, which makes banks taking advantages of ICT utilization.

In today's globalized economy where accessing to ICT dominates economic success, the provision of cost-effective & quality services to customers are becoming a key factor of growth of banking sector in Bangladesh (Basel Committee Report, 2001). As a result, PCBs in Bangladesh are becoming increasingly more competitive in banking sector as a whole (Bangladesh Bank, 2013). It is putting further emphasis on providing innovative facilities to their customers for continuing positive value added each year (Bangladesh Bank, 2013). In contrast, public owned banks are becoming victim on loan default and its stagnation on providing digital services is undeniable. Today in Bangladesh, electronic communication is becoming a cornerstone for its business, every government agency and economy such as PCBs utilizing ICT is playing a significant role promoting its advancement. Because of many socioeconomic factors and current weak facilitation of broadband or Wi-Fi services, the electronic banking services in Bangladesh are still new. This scenario is severe in rural areas where nearly 70 percent of total population lives in. However, this limitation is not becoming a bottleneck in banking revolution in Bangladesh. It is moving one step further in the progression by utilizing the mobile phone option where over eighty percent population of the nation has access to it (Wagemaker et al, 2013). In addition to online facilities, it allows business parties or individual to pay directly or to debit accounts via mobile phone. It provides users with the ability to authorize payments, reconcile accounts, and access a variety of other banking services with the help of ATM, visa card, master card, Q-cash, E-cash, Ready cash etc. In recent years, introduction of mobile facilities including bKash, electronic notification of transactions etc. in Bangladesh appear to be becoming further appealing to the customers where some banks are taking advantage of it. This is because here customers are not required computer literacy to perform banking. Some of these PCBs have personalized ATM booth for 24hrs cash withdrawal in its limited locations and since the notification on each transaction goes directly to accountholder via mobile, the security issues here are assumed to be protected.

With these prospects & opportunities, banks, particularly the PCBs compete in the market attracting bank-customers by providing quality of services where banks very often face challenges in determining & emphasizing factors in its operation. More specifically, in today's globalization, utilization of ICT and then expansion its customers are becoming two important preconditions where banking services in Bangladesh is no exception. Since 70 percent of total population lives in rural areas and since socioeconomic factors have direct influences on accessing to ICT, the PCBs are struggling to expand its services, mainly in rural areas. Therefore, instead of opening new branches, utilization of mobile serves is becoming imperative in aim to reaching out to many potential customers. However, in efforts based on goals, banks are required to gather information on many faucets including socioeconomic factors when it comes attracting individuals in choosing bank(s). It is also a noteworthy here to mention that it would be a daunting task monetarily for an individual bank, particularly for a PCB to carrying out such kind of scientific investigation. This limitation deserves rigorous investigations by academia or by independent investigation

entity for meaningful outcomes. So that expected findings can facilitate banks, namely the PCBs in designing policy options on issue of how to attract its new customers and to keeping up with needs of existing customers.

Meeting these challenging needs, the quest of this study lies in determining the basis on which educated cohort-customers, both depositors and borrowers in banking system make their bank selection. This study aims at to explore these determinants in further detailed in Bangladesh and also identifies factors of customer-orientated services. It will further help singling out determining factors and then position them based on customers' preferences. Therefore, it is expected that the findings can be valuable to banking sectors, particularly to the PCBs when it comes designing its policies attracting customers and expanding its branches even in rural areas of Bangladesh. It should further be helpful to PCBs in keeping its customers intact without fearing to lose them.

Literature Review

Many studies have identified the modern banking needs of business customers. Chen (1999) conducted a survey of 336 domestic-owned and 39 foreign owned banks in Taiwan in 1997 to identify critical success factors adopting various business strategies in the banking sector. Data was analyzed using factor analysis technique which highlighted four factors namely the ability of the bank to manage operations, bank marketing, developing bank trademarks and financial market management. Another survey was undertaken by Thornton and White (2001) to analyze consumers' attitude towards the usage of financial distribution channels. Their findings reveal that banks adopt a multiple distribution channel to meet the needs of different market segments. It added further that if a financial institution finds its profit to be coming mainly from service oriented customers, then it would be best for the banks to concentrate on human interface type of services like branch network. If banks are to attract or retain convenience and technological change oriented customers, then it should focus further on online electronic or digital type of distribution channels. Furthermore, in a competitive banking scenario, customer service, user friendly technology, and sophisticated customer products are important components within the marketing mix. However, communication is also emerging as a crucial element in the marketing activity of a bank (Basel Report, 2001) in today's globalization.

Holstius et al. (1995) cited efficiency issue, maintaining courtesy and resolving complaints promptly as the most important attributes in determining overall customer satisfaction, while other important attributes were convenience of location. Zineldin (1996) conducted a survey of 19 potential factors that customers consider as important in the selection of a bank in Sweden. These factors include reputation, recommendation by others, interesting advertisement convenience of location, opening hours and high technological services. Each respondent was asked to rate the importance of each of the above-mentioned factors on a scale of 5 (very important) to 1 (completely unimportant). His study revealed that friendliness and helpfulness of personnel, accuracy in transaction management, and availability of loans were the most important factors.

Nielsen et al. (1998) conducted a nationwide survey in Australia for 25 banks and 2,500 bank business customers to rank the factors to be considered more important in bank selection process. Their findings reveal that business firms place more importance on the willingness of the bank to accommodate their credit needs and the efficiency of the bank in its day-to day operations. Whereas bankers place higher importance to their ability to offer competitive prices, a full range of products and digital services.

Jamal et al. (2013) took a survey of 300 customers of a specific bank and studied the determinants of customer satisfaction in retail banking in Pakistan. Their results indicate a strong relationship between service quality and customer satisfaction. Rehman et al. (2008) took similar survey of 358 customers of three type banks namely privatized, nationalized and private banks in Pakistan. Their results reveal that customer services to be found number one, which was an expected result because private banks are more customer-oriented than that of nationalized or privatized in general (Basel Committee Report, 2001; www.bangladesh-bank.org). Al-Amin et al. (2010) carried out a study on performance, problems and prospects on e-banking in Bangladesh and identified IT infrastructure, internal network, country domain and above all a high speed optic link to the information superhighway. The Basel Committee Report (2001) identified different types of electronic banking in Bangladesh and then measured customers' satisfactions on e-banking. Relying on Basel Committee Report and BB's own assessment (www.bangladesh-bank.org), the BB has identified few PCBs that are dominating in providing ICT based services in Bangladesh. Dutch-Bangla Bank Ltd (DBBLs), BRAC Bank Ltd, HSBC Ltd, Bank Asia Ltd, Trust Bank Ltd, Mercantile Bank Ltd and Eastern Bank Ltd etc. are major players in PCBs sector in facilitating e-banking services in Bangladesh (www.bangladesh-bank.org; Basel Committee Report, 2001)

A thorough review of literature indicates that earlier studies on bank selection criteria have been mainly conducted in case of more developed countries (Rehman et al, 2008). Such studies have contributed substantially to the literature but their findings may not be applicable to that of today's studies in many developing countries. This is because significant portion of population of these countries still do not have access to internet or they do not use smart phone system. However, the utilization of ICT in today's competitive markets is becoming a primary vehicle of success of banking sector in general in most of the developing countries including Bangladesh (Basel Committee Report, 2001). Furthermore, the earlier studies were mainly relied on bank customers without separately studying the educated young generation who are today more enthusiastic for e-banking. Because of the success on digital banking mainly relies on education level and their age group, the earlier findings might be different from that of today's study in the subject area. On the other hand, the recent studies relate to e-banking in Bangladesh is obviously an addition to the literature; however, these studies were concerned with problem and prospect of e-banking. Therefore, the current literature on e-banking in Bangladesh lacks studies on bank selection criteria. This study is an attempt to bridge the gap in literature.

Overview of Bank Sector in Bangladesh

The banking system of Bangladesh falls under Formal Sector, which is one of the three broad fragmented sectors – the other two are semi-formal & informal sectors where these three together represent the financial system of Bangladesh (BB website). These sectors have been categorized in accordance with their degree of regulation of Bangladesh Bank (www.bangladesh-bank.org). The formal sector includes all regulated institutions like Banks, Non-Bank Financial Institutions (NBFIs), Insurance Companies, Capital Market Intermediaries like Brokerage Houses, Merchant Banks etc.; Micro Finance Institutions (MFIs). The semi formal sector includes those institutions which are regulated otherwise but do not fall under the jurisdiction of Central Bank, the BB, Insurance Authority, Securities and Exchange Commission or any other enacted financial regulator. This sector is mainly represented by Specialized Financial Institutions like House Building Finance Corporation (HBFC), Palli Karma Sahayak Foundation (PKSF), Samobay Bank, Grameen Bank etc., Nongovernment Organizations (NGOs) and discrete government program(s). The informal sector includes private intermediaries which are completely unregulated.

A snapshot of Banks in Bangladesh

After independence, 1971, banking industry in Bangladesh started its journey with six nationalized commercial banks, two public owned specialized banks and three foreign banks. In the 1980's, banking industry achieved significant expansion with the entrance of private commercial banks. Currently, banks in Bangladesh are primarily of two types, which are

1. Scheduled Banks

The banks which get license to operate under Bank Company Act, 1991 (Amended in 2003) are termed as Scheduled Banks.

2. Non-Scheduled Banks

These banks are established for special & definite objective and operated under the acts that are enacted for meeting up those objectives. These banks can't perform all functions of scheduled banks.

There are total fifty six scheduled banks in Bangladesh that operates under full control and supervision of Bangladesh Bank which is empowered to do so through BB Order, 1972 and Bank Company Act, 1991. As shown in Figure (1), these scheduled Banks are classified into six categories. They are

State Owned Commercial Banks (SOCBs)

There are four SOCBs which are fully or majorly owned by the Government of Bangladesh.

Specialized Banks (SDBs)

There are four specialized banks that are now operating which were established for specific objectives like agricultural or industrial development. These banks are also fully or majorly owned by the Government of Bangladesh.

Private Commercial Banks (PCBs)

There are thirty nine PCBs which are majorly owned by the private entities where these PCBs can be categorized into two groups such as

Conventional PCBs

There are total 31 conventional PCBs. They perform the banking functions in conventional fashion i.e. interest based operations.

Islami Shariah based PCBs

There are eight Islami Shariah based PCBs in Bangladesh. These banks execute banking activities according to Islami Shariah based principles i.e. Profit-Loss Sharing (PLS) mode.

Foreign Commercial Banks (FCBs)

There are total nine FCBs that are operating in Bangladesh as the branches of the b a n k s which are incorporated in abroad.

Current status of e-banking in Bangladesh

The existing forms of e-banking that satisfies customer needs in banking are online banking, mobile banking, and Tele-banking. In this progression worldwide, banking system in Bangladesh is no exception, however, the penetration of the process here is comparatively slow but steady. In stepping towards e-banking in Bangladesh, the foreign activities electronically throughout the world were PC banking. Commercial banks first played the pioneering role with adoption of modern technology in retail banking during the early 1990s.

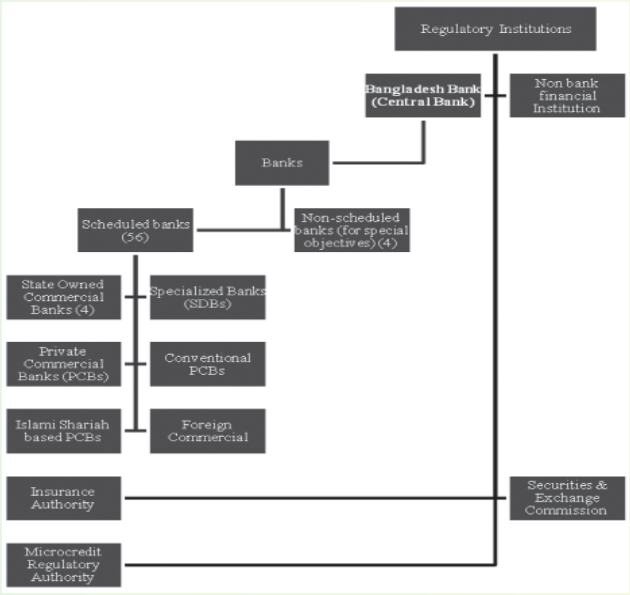


Fig 1: A snopshot of classification of Private Commercial Banks (PCBs) in Bangladesh

However, during this revolutionary period, the SCBs and PCBs came forward with technology based services in a limited scale. In the middle of the current decade, the banking industry as a whole, except for the four SBs, rushed to offer technology based banking services (Al-Amin et al., 2010) where online services dominated the progression.

However, because of technological slow progression, having weak Wi-Fi services and being it expensive monetarily, a limited segment of bank-customers have been attracted to these services. Furthermore, since socioeconomic characteristics vary from area to area, mainly between city and rural, banking sector, particularly the PCBs are struggling to attract individuals using traditional approaches. On the same token, providing services that require utilization of network are giving fruitful outcome mainly in city areas where 20 to 30 percent of the total population live in city or urban areas. Therefore, services that require utilization of mobile phone have significant prospects (Wagemaker et al, 2013) in Bangladesh where over 80 percent of total population has access to mobile phone. The e-banking system can be classified and defined in Bangladesh perspective as follows

PC banking

PC banking refers to use of personal computer in banking activities while under PC home banking customers use their personal computers at home or locations outside bank branches to access accounts for transactions by subscribing to and dialing into the banks' Internet proprietary software system using password. They are two types i) online banking and ii) Internet banking.

Online banking

Transactions in online banking are performed within closed network for which the customer use specialized software provided by the respective bank. At present, 29 scheduled banks offer any branch banking facilities through their respective bank online network. Under modernization program of the National Payment and Settlement System, Bangladesh Automated Clearing House (Check Processing System and Bangladesh Electronic Fund Transfer Network) is also now in practice.

Internet banking

Internet banking refers to the use of internet as a remote delivery channel for banking services which permits the customer to conduct transactions from any terminal with access to the internet. Only 7 out of 48 banks are providing some banking services via internet that include account balance enquiry, fund transfer among accounts of the same customer, opening or modifying term deposit account, check book or pay order request, exchange rate or interest rate enquiry, bills payment, account summary, account details, account activity, standing instruction, loan repayment, loan information, statement request, check status enquiry, stop payment check, refill prepaid card, password change etc.

Mobile banking

Mobile banking is a term used for performing balance checks, transaction notifications, payments etc. via mobile phone.

Tele-banking

Tele banking refers to the services provided through phone that requires customers to dial a particular telephone number to have access to an account which provides several options of services. Despite having huge potentials, Tele-banking services have not been widened enough in banking activities in Bangladesh. Only four banks so far provide a few options of Tele-banking services such as detail account information, balance inquiry, information about products or services, ATM card activation, check book related service, bills payment and credit card service.

Remittance (electronic way)

Today's fast changing electronic banking channels have massively improved the flow of remittance across the world. In Bangladesh, banks have grown up relations with many international financial agencies to master the inflow of remittance into the country from the expatriates working in foreign countries. A few such operators working in Bangladesh are: Western Union Money Transfer, Money Gram, X-press Money and bKash etc. The bKash is a dominating service facilitator when it comes counting the number of users where thousand and thousand of rickshaw-pullers nowadays are taking advantages of the program.

Other Services

Complaints handling, account opening procedure, bank information, change request etc. can be completed utilizing ICTs in PCBs sector in Bangladesh (www.bb.org.bd)

The Purpose of the Study

Banking sector in Bangladesh has been growing significantly despite its social and economic problems. However, only a few studies are found that has made efforts determining the crucial factors that customers perceive as important in their choices of bank selection. This study is initiated to accomplish this goal where seven PCBs located in Dhaka City are randomly chosen for this case study. The main objectives for conducting this research are To assess and determine the importance of selected factors used by educated-cohort-customers in bank selection for its banking To compare the usefulness of services using ICT offered by PCBs located in Dhaka City To provide bank executives with insights on existing & potential services that bank customers find most to be appropriate for meeting their 21st Century needs To provide PCBs executives with insights on how to reaching out potential customers in rural areas without opening new branches

Research Methodology

Commercial banking in Bangladesh has undergone methodological changes during the last decade. For instance, 1980s, the Government of Bangladesh decided to privatized most of the nationalized banks and added more PCBs. Since then, this sector is becoming further competitive and with supporting policies by BB, PCBs are expanding its service facilities utilizing more ICT innovations than ever before to attract or retain its customers.

Sample selection

Since the non-scheduled banks operate with limited functions as defined by the BB (BB website), the customers of these banks are excluded in our survey sample. Similarly, based on the purpose of our study, in selecting our survey sample, we eliminate the customers of the Islamic Shariah based PCBs and FCBs from the category of PCBs. Therefore, the respondents of our survey questionnaire are customers who represent the total number of students & service-holders of universities who fit in "educated cohort population" category. For convenience and narrowing down the scope, setting with further constraints in sample selection, we randomly selected students & service-holders at the American International University-Bangladesh (AIUB) located in Dhaka City. This sample should represent the students & service-holders of all universities in Bangladesh. In this study, the respondents were comprised from diverse academic disciples namely Faculty of Engineering- EEE, CE and Arch, and Faculty of Arts & Social Sciences. Student respondents were selected from all students who were enrolled and completed either Principles of Economics (PE) or Masters in Development Studies (MDS) Course, in Fall Semester of 2014-15. The Classroom Section(s) for the PE Course (undergraduate level) was chosen based on current author's easy access to it. In other words, the current author was assigned to teach students of Classroom Sections ranged 5 out of 20 Sections for the PE course and of Classroom for MDS.

In this study, the service-holders were comprised of 100, made up of three subgroups namely 4th class employees (who were schooled but not graduated), administrative employees (with at least university degree) and faculty members (with at least postgraduate degree). This group was interviewed at their convenient time on AIUB campus located in Dhaka City.

Data collection and manipulation

Data collection

For this analysis, the survey questionnaire was prepared and data information was collected from the selected sample size where questionnaire was passed on to students along with their assignment & take home exam and service-holders were interviewed. With an arbitrary ratio 2:1 of students vs. service-holders, 300 (N = 300) respondents were randomly selected where the student-portion of the ratio belongs to the said 5 Sections. Most of the respondents were customers of one or more of the banks namely BRAC Bank Ltd, Dutch-Bangla Bank Ltd, HSBC Bank Ltd, Bank Asia Ltd, Trust Bank Ltd, Mercantile Bank Ltd, Eastern Bank Ltd. These banks are positioned here weighing to its degrees of providing ICT services in Bangladesh (Al-Amin, 2010; Basel Committee Report, 2001). It is assumed that these banks represent the conventional PCBs, under the category of "Scheduled Banks" as defined by Bangladesh Bank, located in different cities in Bangladesh.

Questionnaire structured

The questionnaire was structured to collect information with raising first question on ownership of their bank(s). By so doing, the respondents other than the PCBs were

immediately eliminated from the sample size. Therefore, the survey process had taken little over two months and it was started just after midterm exam while the current author was teaching the second part, macroeconomics, of the Principles of Economics Course. The structure & question set of the questionnaire were conceptually much clear to the students while they were introduced the Chapter of Financial System of Bangladesh of Macroeconomic in classroom. With this token, the determining factors of bank-selection and its importance & evaluation were discussed in classroom as the time arose in aim to ensure the accuracy of their response.

Data manipulation

For measuring the importance of factors, Lickert Type Scaling was followed in designing question and answer was used (1 = not important, 2 = sort of important, 3 = important, 4 = very important and 5 = mandatory). Based on the purpose of the study, total 11 factors were listed and most of them were derived from similar studies conducted in other developing & developed countries (Karin Holstius and Rehman et al., 2008). Few of the 11 were derived from current banking literature with necessary adaptations made for Bangladesh banking system. Furthermore, for capturing current status of digital banking in Bangladesh, the ICT factor is broken down into 4 sub-segments namely ATM, Online, Mobile and bKash. The reliability test was conducted for these factors and Cronbach Alpha value came out to be 0.83.2 (see Appendix I).

Research Findings

The findings of the study can be summarized as follows

Demographic & socioeconomic factors

The demographic and socioeconomic characteristics of respondents are shown in Table-1. The respondents profile gives an indication to bank customers' age group, education level, position type (substitution of "income level" variable), employment and account type with the PCBs. For capturing detailed characteristics of customers in Bangladesh perspective education level, position type in profession and employment type were broken down into sub-segment.

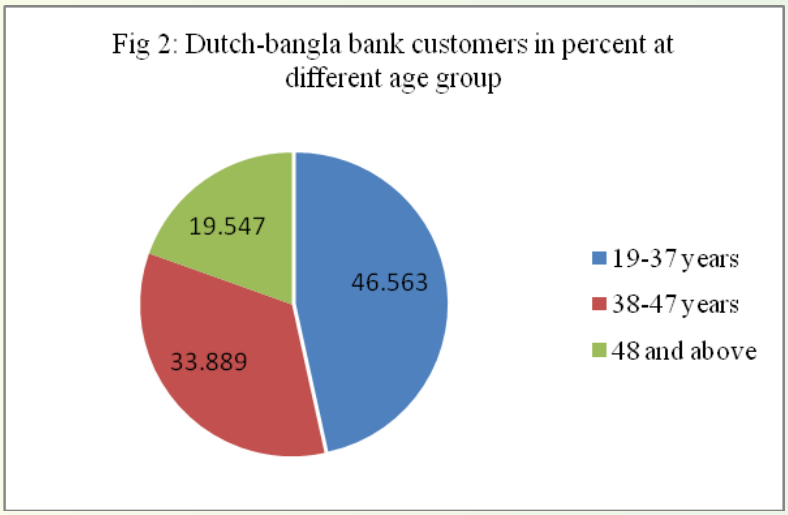
Age group

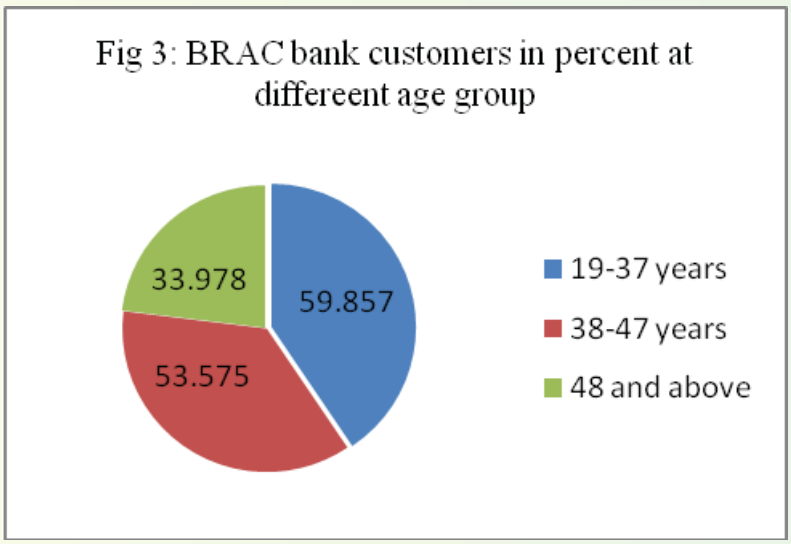
The customers' demographics show that most of the customers of PCBs fall in cohort of 19 to 38 years whereas cohort 39 to 48 years represents the second most, the cohort of 49 to 58 years placed in 3rd position etc. Table-1 clearly shows that different age groups have significantly dominated the percentages of customers of DBBL, BRAC and HSBC bank located in Dhaka City. Therefore, instead of taking on all seven banks, in this section, this study takes on three banks namely DBBL, BRAC and HSBC for comparison.

With the age distribution for comparison, the percentage of customers in different PCBs can be shown as follows

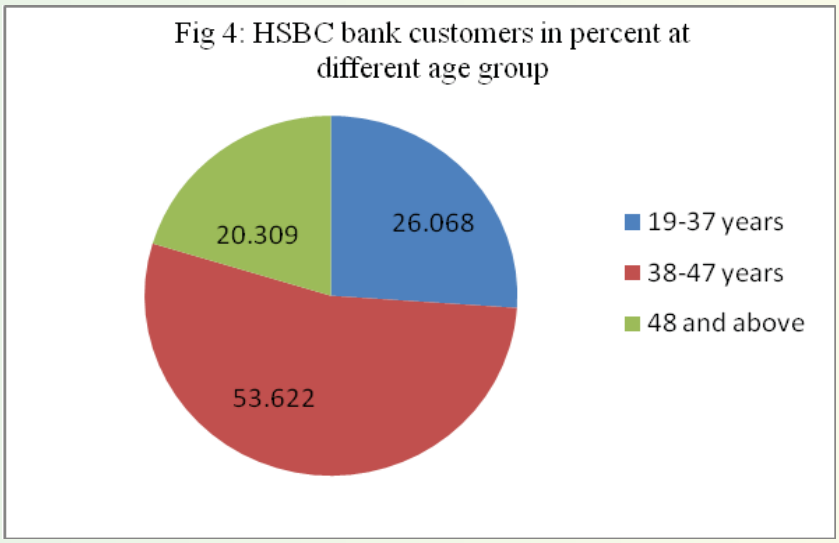
The age group 19 – 37 years in Fig-2 has dominated by 46.56 percentages of total Dutch-

Bangla-bank customers. However, the same age cohort shown in Fig-3 has dominated by 59.86 percentages of total BRAC-bank-customers, which is 13.3 percentages higher than that of total Dutch-Bangla bank customers.





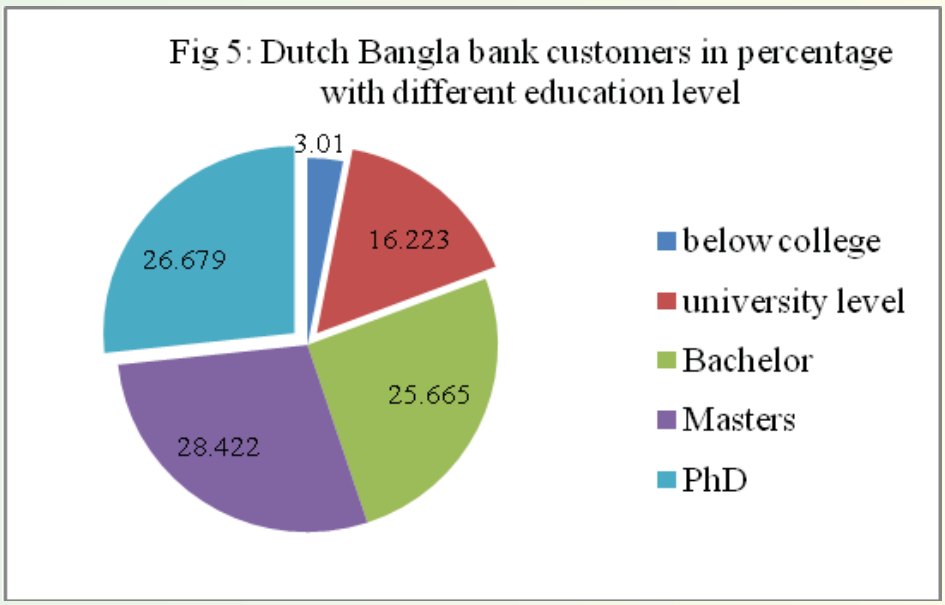
In contrast, Fig-4, the cohort group 38 – 47 years has dominated the customers' numbers by 53.62 percent in the HSBC bank.



Education level

The sub segments of "education level" are below college, university level, which represents currently students in university or college levels, which includes sub-segments such as 1st year, 2nd year, 3rd year and 4th year students. Furthermore other sub segments of the "education level" are Bachelor degree, Master degree and PhD degree.

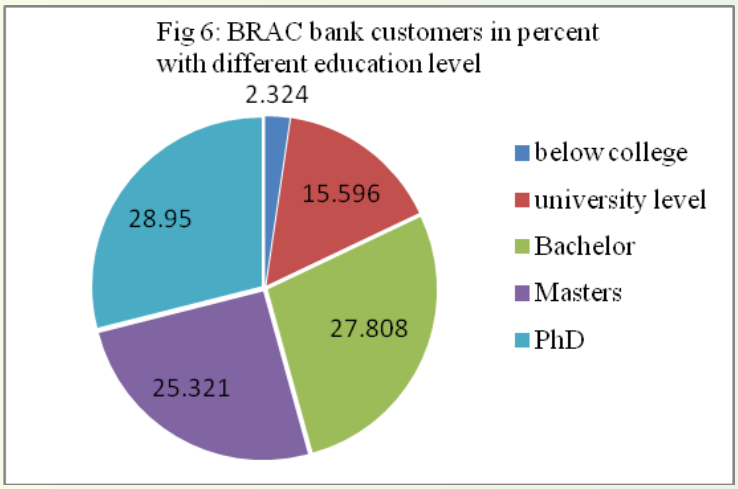
Fig-5 shows that 16.23 percent customers are university or college level students in case of Dutch Bangla Bank where Master degree holders dominated the Dutch Bnagla bank custoemts.

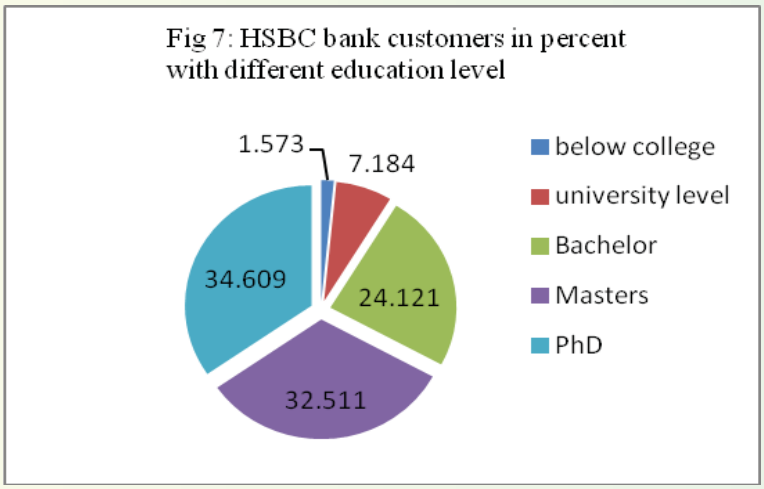


It is worthy to mention here is that the 4th class employees, probably with below college level education, do not require having account with bank for cashing salary from the AIUB. However, all other employees are mandatorily required to cashing salaryies through bank accounts. Furthermore, currently AIUB has chosen Dutch- Bnagla Bank for banking services. In contrast Fig-6 shows that 15.60 percent customers are in university or college level students in case of BRAC bank where Bachelor degree dominated the customers.

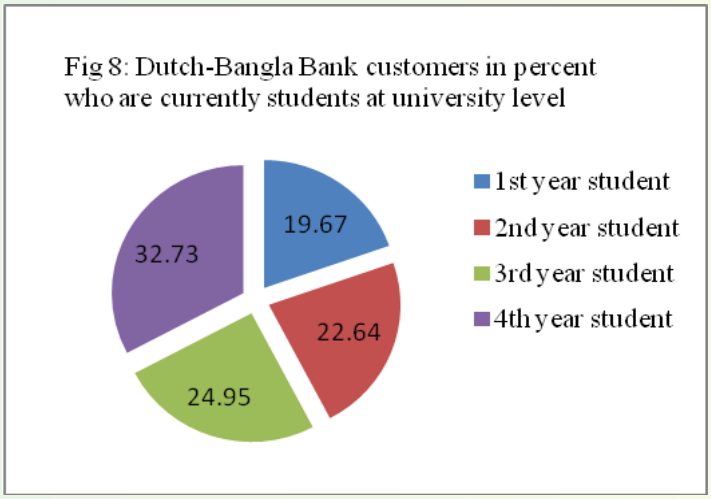
Whereas, Fig-7 shows that 7.84 percent customers are students in university or college level in case of HSBC bank where PhD dgeee dominted the customers' percentages.

It is noteworthy to mention here is that choosing HSBC bank has advantages when it comes interest rates. Furthermore, most of the customers in HSBC bank have more than one account with another bank and most of them have investment or savings accounts.



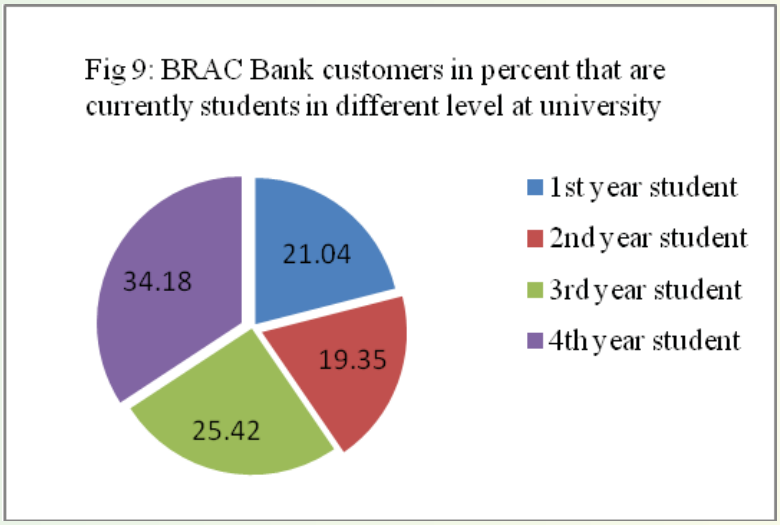


The statistical data on student-customer group is shown in Fig-8 to Fig-9 for Dutch-Bangla, BRAC and HSBC banks respectively.

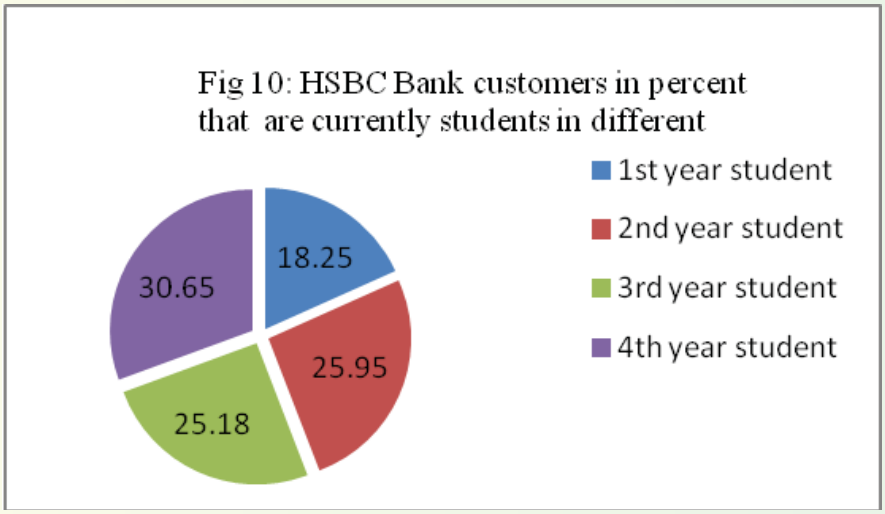


Employment type

Fig-11 shows that little over 50 percent of the Dutch-Bangla Bank customers have fulltime position whereas Fig-12 shows that 64.15 percent of BRAC Bank customers' have fulltime position in employment.



In contrast, Fig-13 shows that 56.75 percent of HSBC bank customers have part-time position.



It is noteworthy that most of the faculty members in different universities located in Dhaka City have par-time positions where they are retired from previous job or they more than one job.

Position type

Fig-14 shows that 49.63 percent Dutch-Bangla bank customers are faculty members whereas Fig 15 shows that 48.24 percent BRAC bank customers are faculty members.

In contrast, Fig-16 shows that 63.56 percent HSBC customers are faculty members in Dhaka City.

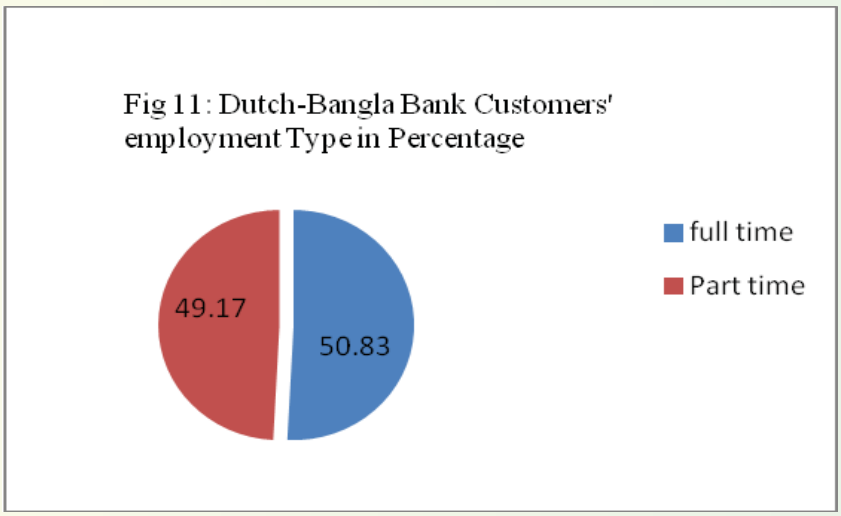


Fig 12: BRAC Bank Customers' Employment Type in Percentage

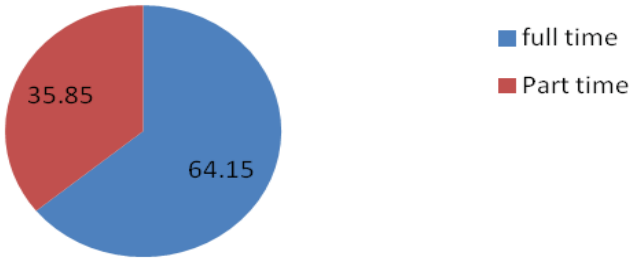


Fig 13: HSBC Bank Customers' Employment Type in Percentage

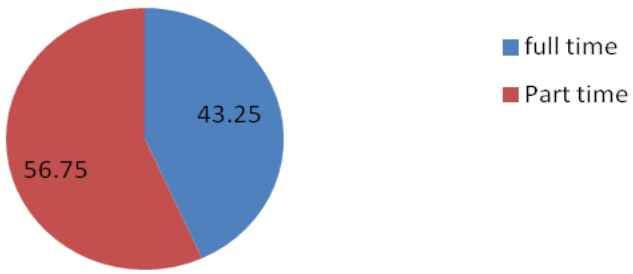
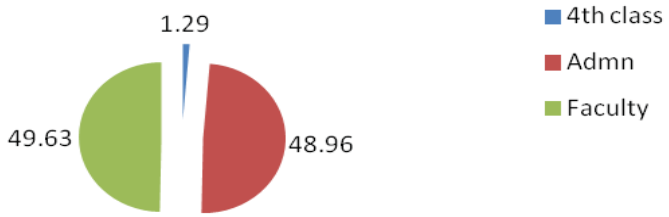
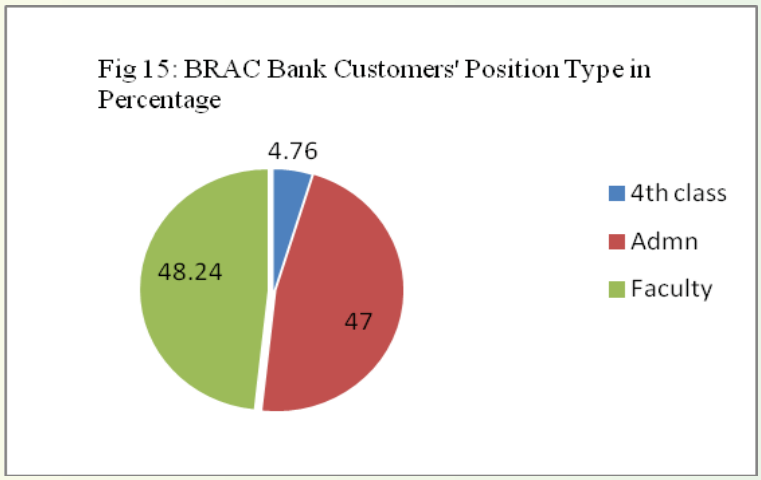
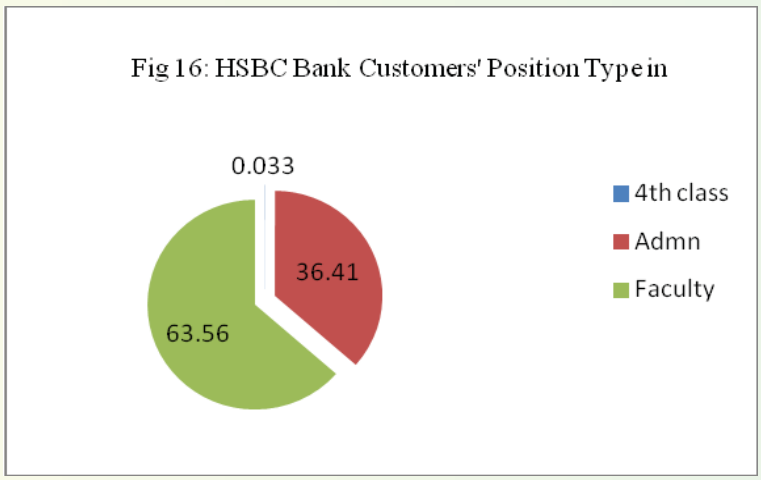


Fig 14: Dutch-Bangla Bank Customers' Position Type in Percent





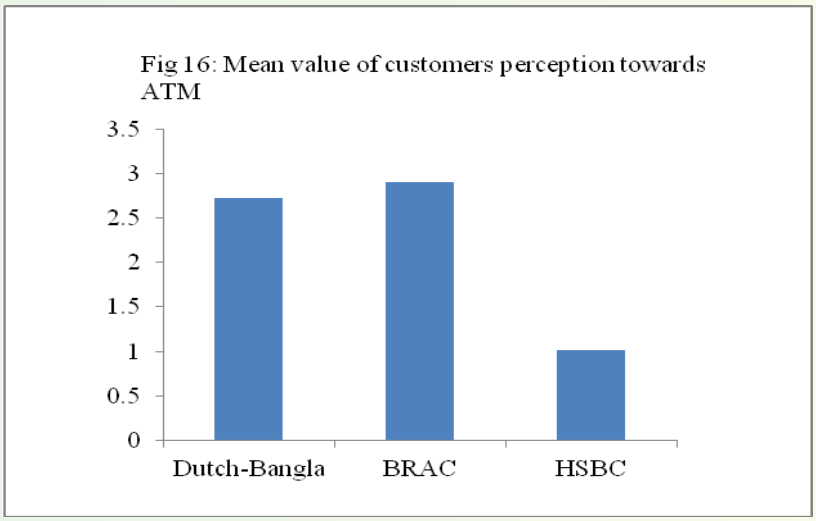


ICT utilization perspective

Table - 2 highlights the customers' perceptions towards the most important factors that they perceive in their choice of PCB in Dhaka City. Mean values are calculated. It was not surprising that the most important factors to bank customers were ICT oriented services where mobile phone services dominated the process and the profit rate placed second where convenient location was also important. In contrast, overdraft protection & motivational efforts by banks were identified as least important factors. In preference evaluation perspective, Table - 2 clearly shows that customers of three PCB banks namely Dutch-Bangla, BRAC and HSBC have dominated the utilization of ICT. Therefore, this study has chosen the customers of the said three banks for further evaluation on utilization of ICT in choosing banks for banking services.

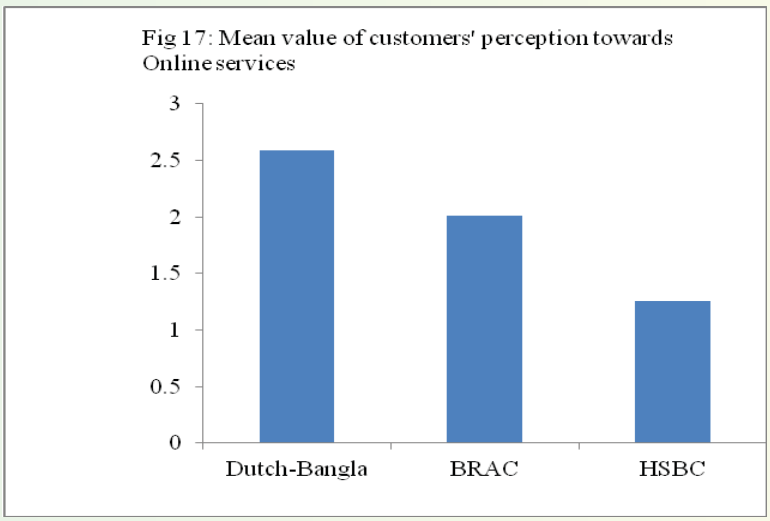
Utilization of Automatic Transaction Machine (ATM)

Fig-16 shows that the BRAC bank has dominated attracting customers when it comes facilitating the utilization of ATM where mean value of the of customers' perceptions toward ATM is 2.9 whereas the mean value in case of Dutch-Bangla bank is 2.79 and HSBC depicts 1.01, which placed the 3rd among all PCBs.



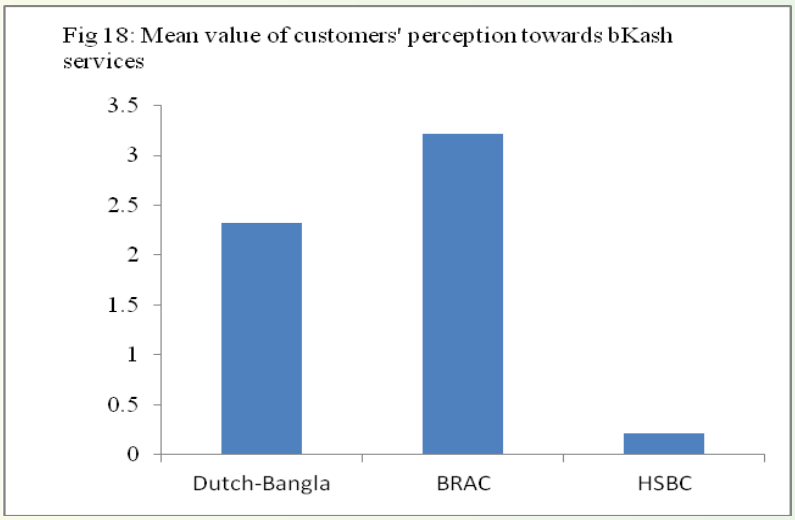
Online services

Fig-17 shows that, the Dutch-Bangla bank has dominated attracting customers when it comes providing Online services. In this aspect, BRAC placed 2nd and the HSBC placed the 3rd among all PCBs located in Dhaka City.



Mobile phone services

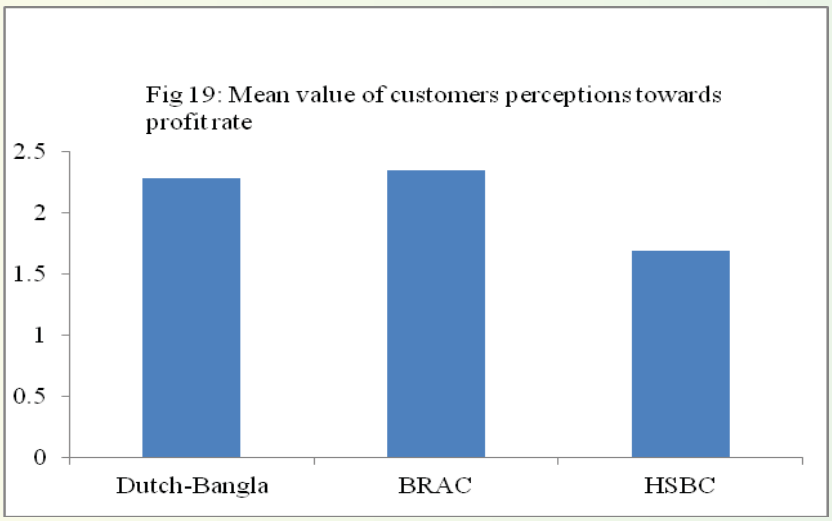
Fig 18 shows that the highest mean value of customers' perceptions towards



attracting customer is 3.12 when it comes mobile phone services, which is dominated by Dutch-Bangla bank in Dhaka City. In this aspect, BRAC placed the second, which depicts mean value 2.49. The HSBC shows 0.79 and placed the 3rd among all PCBs in Dhaka City.

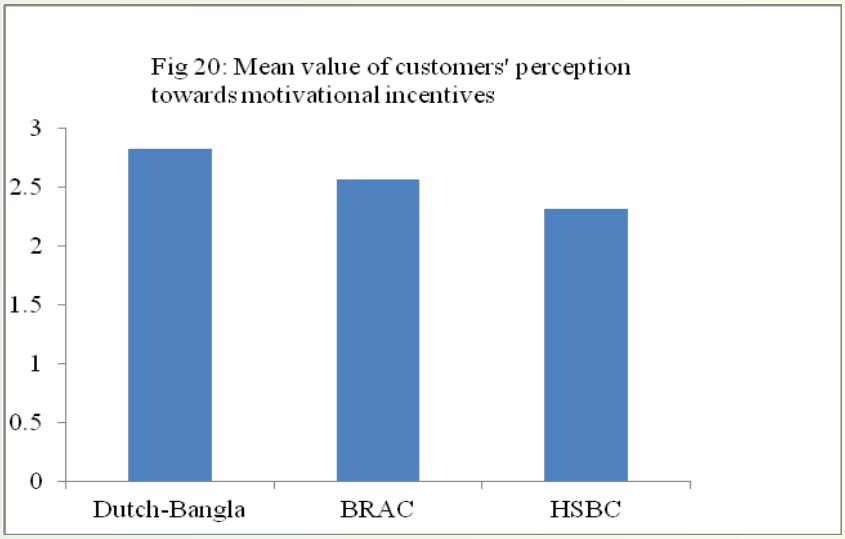
bKash services

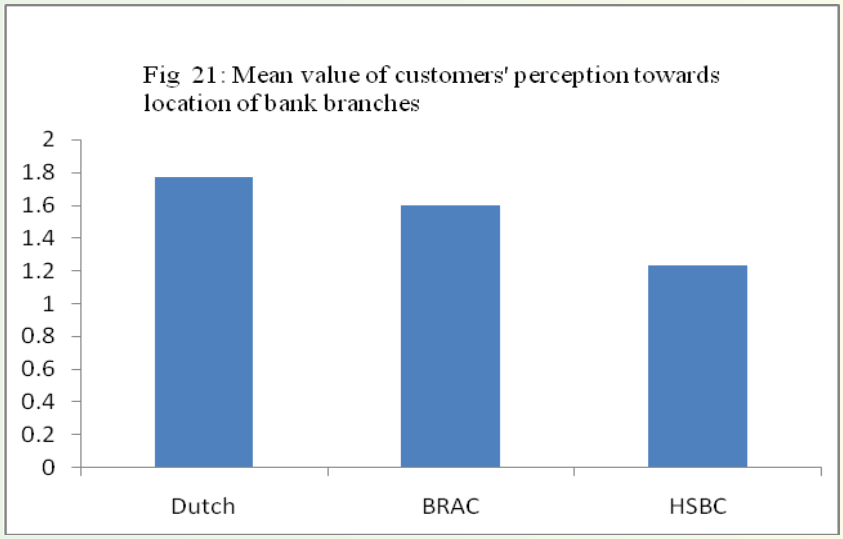
The BRAC bank has dominated the bKash services when it come attracting customers where the mean value is 3.22. In contrast, Figure 19 shows that the Dutch-Bangla bank placed the 2nd.



Other factors that influence attracting customers

Beside demographic, socioeconomic and ICT utilization factors, PCBs influence customers' preferences using many other factors including profit rate, other incentives and location of bank branches.





Profit rate

Fig-20 shows that the Dutch-Bangla bank dominated when it comes attracting customers by offering profit rate for higher investment. The BRAC placed the 2nd, which depicts mean value 2.35 and the HSBC placed the 3rd among all PCBs in Dhaka City.

Motivational incentive

Fig-20 shows that the Dutch-Bangla barely dominated when it comes offering motivational incentives. The BRAC bank placed the 2nd which depicts mean value 2.56. The HSBC placed the 3rd among the PCBs in Dhaka City.

Location as a factor

Since differences among mean values are not significant, Figure 21 shows that most of the PCBs have tried attracting customers by reaching or locating branches near to them. In this aspect, the Dutch-Bangla dominated attracting customers. The mean value 1.596 puts the BRAC in the 2nd position and the HSBC with mean value 1.236 placed it 3rd among all PCBs.

Factor analysis and the findings

Factor Analysis was used to identify the primary factors that customers perceive as important for their bank selection. The Table-3 represents the results of factor analysis. All characteristics with factor loadings of 0.50 and above were retained. Extraction method is based on Principal Component Analysis. This study has identified three major factors for the customer choice for each of our seven PCBs namely DBBL, BRAC, HSBC, Asia, Trust, Mercantile and Eastern Bank. The most important factors for bank selection were digital banking services, particularly the mobile phone & ATM services dominated accordingly; profit rate and convenient location placed second and the third according. Next to these are the factors related to customer-oriented services, fees & easy to open and overdraft services accordingly protection provided by the banks. Convenient location and then profit rate played role in attracting customers significantly in case of Asian, Trust, HSBC and Mercantile accordingly. Survey interviews where faculty members, administrative personnel and 4th class employees were very often interviewed informally on additional factors were helpful for better understanding on customers' perceptions. This extra information suggests that higher degrees along with higher salary customers had more than one account namely fixed, savings and other accounts with small PCBs in addition to their checking accounts with DBBL or BRAC. Therefore, it can be claimed that education level and certain cohort population (age > 50) were customers mainly at small PCBs where banks profit rate & convenient location, bank image and better customer services attracted them. Table-4 provides with results of multivariate analysis.

These results provide bankers in PCBs sector with insight into demographics of their customers' bases. This should help banks to position themselves in accordance with the needs of their respective customers. In depth review of this analysis reveals that employees holding at least two jobs are more likely to hold a bank account in small PCBs. Similarly, higher qualification level makes bank customers more in favor of certain factors that small PCBs likely to offer for attracting them where the customers care more ICT services than that of others because of their time values.

Implication of the Findings of the Study

Implication of the findings of this study can be seen in two phases, government and private sector perspectives. Because of inappropriate plans and of poor implementation, the National ICT Policy 2002 could not reach the perceived levels of success. Consequently, government took initiatives in 2008 and then in 2009 for updating the National ICT Policy in aim to make it befitting with the current and foreseeable future needs of the country. Parallel to this development, banking sector was inspired by BB and introduced privatization and began licensing significantly for new additional private banks since 2000s.

The objectives of the latest National ICT Policy are enhancing the following for a sustainable economic growth

Social equity

Productively

Integrity

Education and research

Employment

Strengthening exports

Healthcare services

Universal access to ICT

Environment, climate and disaster management

Supports for worldwide movement for utilization of ICT

By voicing with the Worldwide Movement for utilization of ICT, Bangladesh has aspired to prosper with its exciting opportunities and by managing its challenges. And under the umbrella of government efforts & policies, few foreign countries & organization have extended its cooperative hands in many faucets including monetary funds. With this help, few local private organizations namely the BRAC, BIID, Grameen Phone and to a lesser extent Tele Talk has professionally entered the mobile applications market (Wagemaker, et al., 2013). In returns, number of users of mobile phones in Bangladesh now surpasses that of other Southeast Asian Countries including Pakistan and India. The ownership of this achievement is not just limited within the government but it is beyond the government where the local private organizations including the banking industry have played significantly for the success.

Since the profit of a bank and the number of its customers are directly linked and since the ICT sector is expected to contribute significantly to government revenue generation, the application of the findings of the study can be a win-win situation for both the banking sector and then for the government as a whole. With the success in mobile phone sector as an inspiration in journey, the nation should be encouraged completing the daunting task

under the BB umbrella where banking sector can play significantly by providing ICT based services to its customers and for attracting the new ones to be its customers. Therefore, the findings can be inspirational tools in designing banking policies for its better outcome. It can further be an educational guidance for the government when it comes designing banking policies so that banking sector as a whole can be inspired and in default the government should be able generating additional revenues through ICT policies.

Conclusion

The PCBs in Bangladesh are desperately moving into a further competitive financial atmosphere with a wider variety of financial and customer oriented services utilizing ICT. This study has focused on determining major factors in bank selection by its customers. The findings of this study reveal that ICT banking facilities, particularly the mobile bKash & electronic notification on transactions, ATM & Online services and profit & interest rate have dominated when it comes to bank selection. Convenient location of bank-branches, mostly in case of small PCBs is also considered to be one of the important choice determinants. While bank service charges, bank documentations, employees' attitudes and sitting arrangements were found to be insignificant factors in this study. However, bank employee attitude & behavior was considered to be a significant factor in certain age group customers where customers looked for friendly attitude of employees working at their selected banks. These determinants may vary slightly from city to city but it should not be significant because here population is not significantly divided based on culture in Bangladesh. The findings of this study can provide a guide to banks in designing their future strategies in competitive economy.

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Efficacy of Pursued Monetary Policy in Bangladesh from 1975 to 2014.

Mohammad Abul Kashem[1]

Abstract

The major objective of this paper is to examine the dynamic and causal linkages between Reserve Money (RM) with Net Foreign Asset (NFA) of Bangladesh Bank (BB) and Government Net Borrowing (GNB) from Bangladesh Bank over the period of 1975 to 2014. Though NFA is merely a part of RM but in reality it has an exogenous or autonomous nature. Therefore, we applied unit root tests, Johansen co-integration test, error-correction models and Granger causality test by taking care of the stochastic properties of the relevant variables. Both short run and long run relationships of RM with GNB and NFA of BB have been confirmed, i.e., RM is caused by GNB and inflows of foreign currencies. Thus BB's money supply depends on growth in as well as growth of NFA. The autonomous nature of NFA is weakening BB's scope to curb money supply. The paper attempts to fill in the existing gap in literature regarding monetary policy implementation process in Bangladesh.

Key words: Monetary Policy, Domestic Credit, Reserve Money, Broad Money, Co-integration, Bangladesh.

Introduction

The paper attempts to examine the dynamic causal relationship among some crucial monetary variables in Bangladesh. In the backdrop of conventional monetary economics and development strategy the central bank of many developing countries in the world focus on the empirical relationship among monetary variables like Reserve Money, Narrow Money, Broad Money, Government Credit, Private Sector credit, Income or growth rate, inflation etc. This emanates from the fact that controlling money supply becomes the major tool to stimulate real demand as well as economic growth and to stabilize price level in the economy. Despite

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of having voluminous theoretical and empirical literature in economic text perhaps there is no academic study in Bangladesh about how much Bangladesh Bank pursued policies to conduct monetary policy is effective. Though economic texts have some gross theoretical discussion they suffer from the practical knowledge of central banking in cases of Bangladesh. Discussing with many local academicians, researchers etc. the author of this paper perceived that there is a severe gap of knowledge of monetary policy conducting procedure in Bangladesh. How BB pursues the job of regular fine tuning, sterilization, keeps exchange rate stable etc. This paper will fill up some extent this gap for the existing appetiteness of the stakeholders.

Monetary policy in Bangladesh, as outlined in Bangladesh Bank order 1972, is formulated and conducted focusing on inflation and income growth rates as the basic policy targets. To achieve these targets an empirical rule oriented i.e. based prior experience of monetary aggregates such as reserve money, broad money and domestic credit (both private sector and government), Net Foreign Assets (NFA) etc. are also projected for a particular fiscal year, and subsequently monitored and controlled to achieve the desired targets, where they can be revised for newly developed backdrops in the economy. Bangladesh Bank is not fully independent as there is a significant level fiscal dominance still works from the government parts regarding borrowing of the government from the central bank as well as banking systems. However, in terms of policy initiation and implementation Bangladesh Bank enjoys full independence from the fiscal side. In case of issuance and sale of any bills BB does not need to care any other authority. Hence, this bank can float, apply and operate instruments in any extent they need to control the money supply. In Bangladesh as output growth gets priority over inflation control BB needs, like many other central banks in developing countries, to sacrifice some extent inflation to achieve the targeted economic growth. "Bangladesh Bank is in a position to conduct an independent monetary policy for price stability through a monetary or an inflation targeting strategy. Inflation targeting as a strategy of monetary policy, however, remains conditional on a set of stringent conditions and is considered not appropriate for Bangladesh at this juncture. Monetary targeting may, therefore, be considered an alternative option, given that under the present market-based exchange rate system, the Bangladesh Bank has gained an effective control over the monetary base and that there exists both a stable money demand function and a situation of monetary stability as envisaged by monetary economists for a monetary rule." Hossain (2004).

Broad Money (BM) is thought as the true representative of money stock of the economy. In this regard Bangladesh Banks sets a target of growth of Broad Money. Measuring empirical relation with the Broad Money (BM) BB fixes up a target of growth of Reserve Money (RM) on what it has direct control through administrative control on commercial banks as well as regular fine tuning activities. Thus, BB sets up RM to control money supply for achieving target of level of the BM. As BB is instrumentally independent from the fiscal side it largely becomes successful to keep the RM in its targeted level. There is a direct positive relation between Government Net Borrowing (GNB) and RM or Base Money. Hence, when GNB increases RM also increases and ultimately money supply in the economy increases. BB accommodates its targeted BM growth keeping coherence with the govt. target of bank borrowing declared in annual budgetary speech

in the assembly of the parliament. The same consequences occur when another important autonomous part of RM namely NFA changes. For regular fine tuning of Base Money as well as sterilization in case accretion of NFA BB uses Repo, Special Repo, Liquidity Supports (as Lender of the last resort), Treasury Bills, Govt. Treasury Bills and BB Bills etc.

BB gets intellectual supports to formulate monetary policy from the International Monetary Fund (IMF) and other the supranational organizations. In addition to that BB discuss with prominent domestic researchers, former BB governors and deputy governors, former other experienced bureaucrats of BB and MOF, professors etc. to polish up the monetary policy in the eve of its Monetary Policy Stance (MPS) finalization. According to their intellect and BBs own discretion it fixes target of RM to control money supply for achieving target of level of the BM. However, as RM has some components on those have no control of BB, such as NFA, governments' credit or borrowing from Bangladesh Bank etc, sometimes monetary policy cannot be implemented in its own course of the central bank. So, at end of the fiscal year level of RM crosses the desired and targeted level and hence, particularly inflation target is failed to achieve. In such a case to curb the money supply and thereby inflationary pressure BB usually tries to adopt tight monetary policy which did not beget success to stabilize the price level in all prior periods of the country's history. Therefore, it is necessary to examine the nexus between NFA and Reserve Money, Government Borrowing and Reserve Money, or Money Supply (i.e. Broad Money) etc. to investigate efficacy of the monetary policy in case of Bangladesh, i.e. whether policies are being adopted by the BB are hatching empirically the due results for the economy. Therefore, the objective of this paper is to examine the dynamics of the causal relationship among some targeted key monetary variables for monetary policy stockholders in case of Bangladesh economy from period of 1975 to 2014.

Defining Money: One of the problems in defining as well as controlling money supply arises from the difficulty in measuring monetary aggregates which, in turn, is a result of the ambiguity in defining money itself. "Money is an ambiguous concept. The ambiguity arises of the same concept-money-to denote an asset that is important for explaining changes in the price level and an asset that renders a variety of services usually summarized by some undefined phrase." – A H Meltzer. From the above quote it is noteworthy that the two important aspects of the definition of money. Money is a difficult concept to define it and secondly, it is an asset. This difficulty of defining money arises from the function it performs. It can be anything that people agree to accept for exchange of goods. However, in addition to being a generally acceptable medium of exchange, money serves three other basic functions for us - a unit of account, a store of value and a standard of deferred payments. Thus anything that performs these functions can also be regarded as money. However, the facts that money is an asset provide us a useful clue to finding a working or operational definition of money. From the accounting view an asset gives its holders a claim and it implies an equivalent amount of liabilities for those against whom the claim is made. For example notes and coins (currencies), the most readily recognizable form of money, are assets for the holders of notes. It gives the notes holder's equivalent claims to the central bank which issues these notes. Therefore, all circulated notes and coins in Bangladesh are the BB's liabilities. Notes and coins are the only

element that forms money. There are also other liabilities of the central bank which are assets for the agents in the economy as well, and hence also form the basis of money supply. Despite of all this complexities of measuring or defining money it is thought that Broad Money (M2) is the actual representative of money stock of the economy. Number of literatures have used M2 as money stock for the economy. Hence, this paper as well as BB also considers M2 as money supply of the economy. BB cannot directly control M2 but it can control RM by its' direct use of instruments. M2 = mm*M0 where M0 is RM and mm is money multiplier. BB estimates MM by its previous experience for the coming fiscal year. Though it is not fixed or constant but it is thought that it does not incur any drastical change in particular year than it last years.

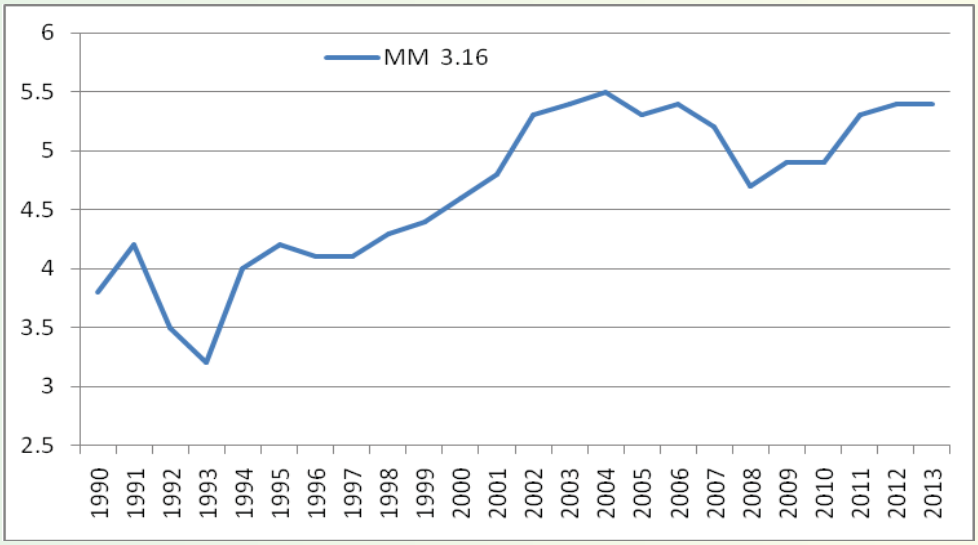

Figure 01: movement of money multiplier (mm) in Bangladesh.

From the above figure it is clear that except only for three years mm for the period of 1991-2014 was within range of 4.0 to 5.5 with low volatility. Hence, BB thinks that mm should be fixed within the short run period. Using this proportionate relation between RM and BM BB tries to maintain targeted level of BM by due manipulation level of RM.

The paper is outlined as per following sections. After introducing the issues in the first section, the second section deals with the theoretical debate, the third section focuses on data, variables, methodologies and econometric techniques. The fourth section highlights the results of the paper. The fifth section explains the empirical results with a brief policy recommendation and finally the sixth section draws conclusion.

2. Theoretical discourse and Debates

First and foremost the question may arise in mind of anybody that how and why BB operates maneuver of money supply in Bangladesh. BB does this virtuous job following the great articulation of Bangladesh Bank Order 1972 where it is mention very specifically that "Whereas, it is necessary to establish a central bank in Bangladesh to manage the monetary and credit

system of Bangladesh with a view to stabilizing domestic monetary value and maintaining a competitive external par value of the Bangladesh Taka towards fostering growth and development of country's productive resources in the best national interest." Upholding this holy national duty in shoulder BB performs monetary policy following the knowledge and implication of some traditional monetary theories. In this regard Fisher's quantity theory of money is worth to mention at first. Pre-Keynesian neoclassical economist Irving Fisher (1911) thinks that money has significant impact on price only if economy is running in full employment level. Let us make a short look on his famous quantity theory of money. The quantity theory of money postulates a one to one and proportional relationship between money supply and price level. This traditional quantity theory of money as presented by Fisher's equation is as follows

$$MV = PY \quad \text{.....(1)}$$

Where, the symbols have their usual connotations in Economics texts. Under the classical assumption of full employment and the short run stability of the velocity (V), equation (1) postulates the proportional relationship between money (M) and price (P) or between money (M) and Income (Y). However, equation (1) can also be written as

$$P = MV / Y \quad \text{.....,..... (2)}$$

By taking natural log in both side of equation (2), it can be rewritten as follows:

$$\hat{P} = \hat{M} + \hat{V} - \hat{Y} \quad \text{……(3)}$$

Where ^ indicates the growth rate of the relevant variables. Due to the full employment Output level (Y) and assumption of money velocity (V) in short run is fixed, so we can say that

$$P = f(M) \quad \text{.....(4)}$$

Equation (3) implies the proportionality between money and price (Classical view). Again if there is unemployment in the economy some also disagrees with this above type of one to one correspondence between price and money supply only and they rewrite the equation (3) as follows:

$$\hat{Y} = \hat{M} + \hat{V} - \hat{P} \quad \text{……(5)}$$

That is, if Money Supply (M) increases Output (Y) will also be increased (Keynesian view). As economy has some unemployment the extended money supply will help to generate employment for the unemployed resources by engaging them into production activities. So by this simple manipulation of Fisher equation we can assume that money supply has impact on income or GDP at least in short run when there is unused resources in the economy.

Interestingly, this identity (equation 1) which is usually known as the equation of exchange, has generated several debates among economists. Firstly, whether the causation in the equation runs from left to right i.e. MV causes PY or from right to left i.e. PY causes MV. Secondly, whether velocity of money (V) and output (Y) are fixed (constant). Thirdly, whether money supply (M) is fixed by the central bank or money supply (M) is defined by the level of Output (Y). Fourthly, whether money supply (M) is defined by the level of Output (Y) or Output (Y) is defined by the Money supply (M). These debating issues are encountered by theorist in several ways. We shall make citation very few of them.

In the classical model output (Y) is taken as determined by availability of capital and labor

and Velocity (V) is assumed to be fixed and, therefore, any exogenous change in money supply leads to change in price level. Money in this case does not have any impact on the real variables of the economy.

However, Keynesians criticized and rejected Classical idea about the proportionality between money and price. They argued that money has effects both on price and output level at least in the short run. According to them increasing money supply causes inflation but also reduce unemployment in the economy. However, Keynes or his followers did not assume full employment. As additional money supply creates additional demand in the economy it augments output as well. Therefore, there is a direct but not necessarily proportional relationship between money and price. Thus, according to the Keynesian school the changes in wages, the price level and the rate of inflation are non-monetary phenomena and are caused by different structural factors not only by Money.

Fisher considered this equation as function of the demand for money. In his version money is demanded only for its medium of exchange role. Alfred Marshall and A.C. Pigou (1923) assume that people demanded money for both its medium of exchange role and store of value role. Thus, Fisher's theory rejects the dependence of the demand for money on interest rates while Marshall accepts the role of interest rate in determining the demand for money. Keynes considers money as tools for transaction, speculative and precautionary demand of the individuals and creates additional demand and thereby it raises income of the economy. Milton Friedman (1956), assumes that people hold money with the intention of using it for upcoming purchases of goods and services. Thus, he integrates asset theory and transactions theory of demand for money within the context of neoclassical theory.

"Money can lose its value through excessive abundance, if so much silver is coined as to heighten people's demand for silver bullion. For in this way, the coinage's estimation vanishes when it cannot buy as much silver as the money itself contains. The solution is to mint no more coinage until it recovers its par value. - J S Mill (1860)

The intuitive debate about the relationship among money, income and price has got its' pace following the publication of David Hume's most celebrated article 'Of Money' 1752. He firstly establishes a proportional relationship among income, money supply and the absolute price level of the economy.

The proponents of monetarism, central bankers and empirical researchers have long been concerned with the nature of the causation between money stock and real economic variables. If the real economic activities solely determine money supply, then monetary policy conductors would be powerless. If, however, changing in the money stock has a significant causal effect on changes in real economic variables, then monetary policy actions would be highly powerful. If a bidirectional causal relationship between money and real economic activities is existed; then, this would lead to an ambiguous implication of monetary policy. Such relation would mean that monetary policy would need to be implemented with special consideration of the feedback effects between real economic activities and money which means that there will be some Hobson's choice or trade off between them.

The classical school discussed that changes in prices, the most important target variable in achieving stabilization, is basically due to changes in money supply. That is, money supply

is neutral to put effect on the real variables of output growth or employment generations. The ultimate implication is that there is a unidirectional causality runs from money to price only and money has no impact on real sectors of the economy.

Monetary Economists criticize the orthodox-Keynesian as explained by the IS/LM model. Monetarist argument is that money supply manipulations by the monetary authority (Central Bank/FRB) were the principal cause of movements in the U.S business cycle Palley (1993).

According to early post-Keynesian scholars such as Joan Robinson (1956), Kaldor (1970), Davidson (1972) and Moore (1988), money appears in the economy along with production when banks agree to honor debt contracts with firms. As the economy grows, banks increase their loans to meet the growing needs of the system, either to pay remunerate for factors of production. The creation of money is thus parallel to the creation of income in the economy. There are three distinct theories of money supply endogeniety: those presented by Accommodationists', Structuralists' and the Liquidity Preference School.

In the backdrop of the presence of high inflation in different countries after World War II due to the adoption of easy monetary policy the Keynesian ideas again came under severe criticism by Monetarists. They held the view that money plays active role in changing both income and price and the causality is unidirectional from money not only to income and but also to prices. The proponent of the Monetarist is the New Classical/Rational Expectations School (RES), while the opponent is the Real Business Cycle School/ New Classical Macro Economics. The RES has ignored the existence of Phillips curve even in the short run. So, they believe that any change in money supply has a direct impact of prices. The RES assumes that real variables including output are determined of monetary factors. Therefore, money and prices have a direct and proportional relationship. On the other hand, the latter school also argues that the technogical shock is the dominant cause of changing income and price level in the economy.

Hicks (1967), Graziani (2003), Rochon (2004) argue that money creation is a result of the evolving debt caused by the relationship between borrowers and lenders. Hence, money is endogenous irrespective of the character of the central bank, the stage of development of the banking sector, financial innovations, or other institutional changes.

The unidirectional causality from money to price has also been attacked by many questions. Fisher (1985) claims the possibility of reverse causation and concludes that there is mutual interaction between money and other macro variables. Friedman and Schwartz (1963) also support this argument by stating that though the influence of money to economic activity is predominant, there is also the possibility of influences running from the other way (at least in the short run). The Banking school also supports the reverse causation between money and income; and, thereby, arguing for endogeneity of money supply in price changing.

Thus, despite the theoretical debate conclusion is that there is a strong probability of causality among money, income and price. Therefore, Bangladesh Bank maintains money supply of the economy keeping in mind that despite the theoretical disputes money does has either short run or long run or both ramifications on price or income or both. Beside these facts BB also try ensuring coherence with the fiscal plan, activities and targets by coordinating with government counterpart.

Here it is worth to mention that though similar studies have been conducted in several

countries in the world; there is no econometric study to the best of our knowledge that has exclusively examined the nexus between NFA and RM, PSC and RM, Government Borrowing and RM, therefore, the present study will fill an important gap in the existing literature and improve the understanding of monetary policy conducted by BB.

3. The Analytical Framework

3.1 Data

This study is based on the annual data for the period 1975 to 2014. Choosing this period is reasoned that after a prolonged socioeconomic and political chaos and influences of their legacies the country started to run in full suing in the present capitalistic mood and restoration of socioeconomic normalcy was in 1975-76. After independence in December, 1971 country was following the socialist principle and from 1972 to 1975 was a period of massive turmoil due to political crises, natural calamity, acute supply shock of food grain etc. Data of this period excluded from the study because of these turbulences of this post war country those can affect both demand and supply side of the economy. We have got the data for this study from the various published issues of Economic Trends by the BB. Yearly data of the Reserve Money (M0) and Broad Money (M2), Net Domestic Assets (NDA) of BB, Government Borrowing (GNB) from BB and Net Foreign Assets (NFA) of BB are

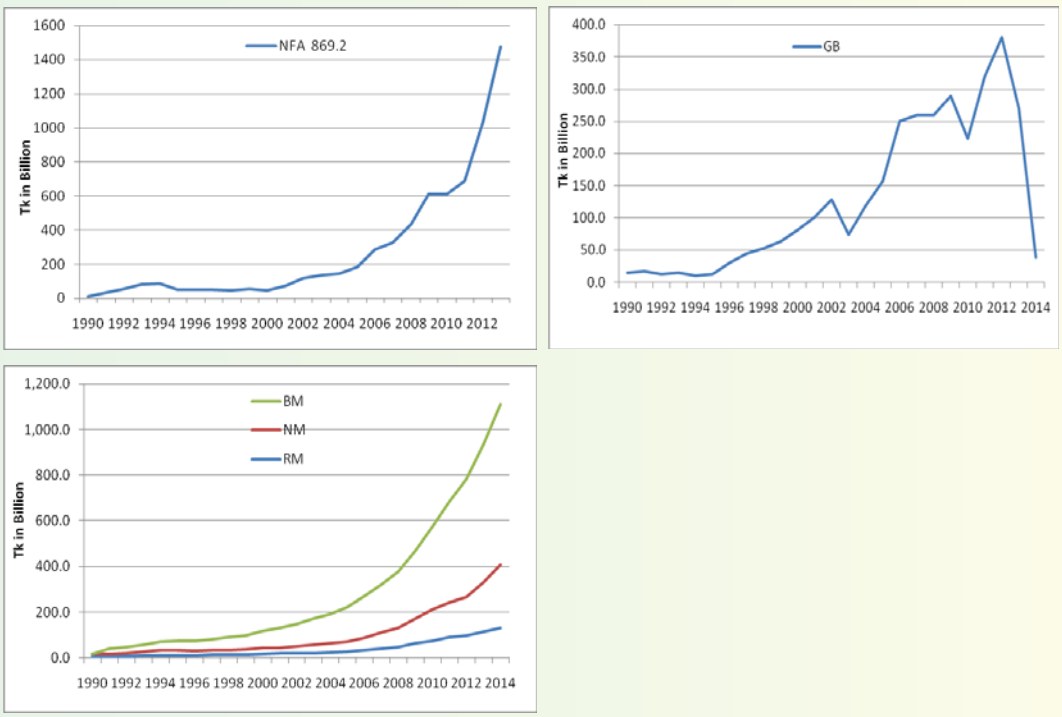

Figure2: Trends of M0, M1, M2, PSC, GB, NFA

collected from the various issues of Economic Trend published by BB on monthly basis. Plots of the year on year (Y-o-Y) growth of some of the time series are shown in Figure 1.

The Figure 1 shows that the M0, M1, M2, NFA and GB exhibit a synchronized gesture i.e. having a tendency to move together implies that they are likely to be causally linked to each other. This causal link, obviously, has further been tested by the various econometric tests considering time series properties of the data.

Methodology and Variables:

Broad Money (BM) centric money supply strategies have been followed by BB to curb the growth of money stock in the economy. BB cannot control BM directly by its market operation or by policy variables. What it can do is that RM can be manipulated by its' usual central bank tools. By controlling RM BB tries to maneuver BM whereas relation between them is defined by BM = mm*RM and mm (= money multiplier) is thought to be fixed in short run. This RM has two major components such as Net Foreign Assets (NFA) and Net Domestic Assets (NDA) of BB. NDA can be broken down into another three major sources which are Net Credit to Government (GNB), Credit to Other Non-financial Public Sector (CONFP) and Credit to Deposit Money Banks (CDMB). CONFP and CDMB consist very negligible amount of NDA and usually do not have any significant cause of change NDA. So, GNB is the major part of NDA. The following table will clarify the calculation process and relation among the concerned variables of this study. Hence, we can finally think that the two major components of RM are NFA and GNB. Our prime target is to analyze the impact of changes of NFA and GNB on movement of RM and thus to figure out the influence of them on money supply.

Table 1: RM and its component **(Taka in Crore)**

Year	Components of NDA					NDA	NFA	RM	BM	mm
	GNB	CONFP	Pvt.	CDMB	Others (Net)					
	1	2	3	4	5	1+…+4 = 6	7	5+6 = 8	9	9/8=10
1990	1489.23	870.5	0	4109.4	-1085.6	6468.7	869.2	7337.9	23157.1	3.16
1991	1677.7	932.6	0	3939.0	-1185.8	5363.5	1137.2	6500.7	25004.4	3.8
1992	1196.9	902.6	0	3373.0	-2037.0	3435.5	3386.6	6822.1	28525.9	4.2
1993	1447.8	882.6	0	2897.2	-1945.7	3281.9	5662.9	8944.8	31535.6	3.5
1994	1009.6	1635.9	0	2576.7	-2073.4	3148.8	8159.1	11307.9	36403.0	3.2
1995	1254.0	1056.8	15.7	2733.8	-3202.7	1857.6	8772.4	10630.0	42212.3	4.0
1996	3036.8	1195.5	15.7	3413.7	-1955.7	5706.0	5297.0	11003.0	45690.5	4.2
1997	4488.9	1192.6	15.7	3600.3	-1823.4	7474.1	4920.4	12394.5	50627.5	4.1
1998	5295.5	1404.8	15.7	3749.4	-2152.9	8312.5	5305.1	13617.6	55869.1	4.1
1999	6359.9	1365.6	808.4	4622.8	-3031.2	10125.5	4617.2	14742.7	63027.1	4.3
2000	8098.0	1320.7	900.4	4289.2	-3210.3	11398.0	5666.1	17064.1	74762.4	4.4
2001	10107.3	1305.1	987.5	4368.6	-2653.5	14115.0	4812.4	18927.4	87174.2	4.6
2002	12834.3	1277.6	1008.1	4729.3	-6506.7	13342.6	7230.4	20573.0	98616.0	4.8
2003	7353.3	1281.9	1141.7	4846.8	-4991.9	9631.8	11809.7	21441.5	113994.5	5.3
2004	11847.6	1241.1	1241.3	5852.1	-9854.0	10328.1	13542.3	23870.4	129721.2	5.4
2005	15674.3	1105.6	1341.4	6132.5	-11531.6	12722.2	14678.2	27400.4	151446.4	5.5
2006	25026.1	1016.0	1429.9	6346.3	-18503.9	15314.4	18640.3	33954.7	180674.2	5.3

2007	25931.1	988.0	1576.1	6442.1	-24273.0	10664.3	28758.4	39422.7	211504.4	5.4
2008	25997.3	946.4	1696.8	7334.2	-21226.4	14748.3	32813.8	47562.1	248794.9	5.2
2009	28955.4	853.1	2022.1	6846.8	-19155.5	19521.9	43227.5	62749.4	296499.7	4.7
2010	22320.6	830.7	2588.7	6613.9	-19392.1	12961.8	61181.0	74142.8	363031.2	4.9
2011	32049.7	776.7	3143.7	18608.8	-26186.6	28392.3	61342.1	89734.4	440519.9	4.9
2012	38044.0	1181.9	3598.7	22627.4	-36579.4	28872.6	68930.1	97802.7	517109.5	5.3
2013	27069.0	1354.5	4180.2	10219.0	-33579.3	9243.4	103246.0	112489.4	603505.6	5.4
2014	3840.6	1202.7	4272.7	6279.2	-33216.5	-17621.3	147496.6	129875.3	700623.5	5.4

Causality among M0 and M2: The hypothesis is that causality is running from Broad Money (M2) to Reserve Money or so-called Base Money (M0). The Post-Keynesian argument is that in the money creation process bank loan disbursed by the banks is caused additional deposits and those new deposits of the banks provokes the central bank to change the M0 and the same process also affects the level of M2. By definition Reserve Money (M0) = Circulated Currency that is Out of Banking System + Cash in Tills of The Commercial Banks + Deposits of The Scheduled Banks to The Central Bank, and Broad Money (M2) = Circulated Currency that is Out of Banking System + Demand Deposits + Time Deposits i.e. there is a common part in both M0 and M2 which is Circulated Currency that is Out of Banking System. Due to such common important part of M0 and M2 changes of M0 can change the M2 too. In addition to that conventional thought is that each M0 and M2 are the true money stock of the economy.

M0-Government Credit from BB causality: In Bangladesh Government credit by BB is a major source of RM. Government credit is an autonomous component of RM as central bank has no right to dishonor government borrowing demand. So, curbing money supply can be seriously hindered by the excessive and unplanned government borrowing particularly from the central bank. Such over borrowing of government can be a direct cause of expansion of RM. Therefore, it is necessary to examine the nexus between RM and GNB level. This is a hypothesis to examine whether empirically BB is successful to curb money supply despite of continual government borrowing. Like many other developing countries the Government of Bangladesh borrows from BB to finance government expenditure especially for development work for the particular fiscal year.

M0- NFA Causality: BB sets up RM to control money supply for achieving desired level of the BM. However, as RM has some components over those have no control of Bangladesh Bank, such as NFA and sometimes monetary policy cannot be implemented in its own course of the central bank due to the unexpected and automatic increase of NFA. When foreign currencies (FC) enter into the country BB needs to buy these from commercial banks basically to proper management of exchange rate. BB needs to buy and sale the FC to the par value of taka at desired level. On the other hand, when BB buys FC from the market automatically domestic currency i.e. money supply of the economy increases. So, when inflow of FC increases money supply of the economy also can be increased. In this situation to curb the money supply and thereby inflationary pressure of the economy BB ultimately fails to adopt tight monetary policy. That is, if sometimes BB is supposed to it pursue tight monetary policy sometimes unintended expansion of NFA can cause of increased M0 as BB needs to buy foreign currencies from DMBs to preserve par value of local currency for overseas transactions. Therefore, it is

necessary to examine the nexus between reserve money and NFA of BB in case of Bangladesh.

3.3 Unit Root or Stationarity Tests

To test the causality and co-integration among variables, at first, the stationary properties of the time series is to be checked by unit root test. That is, it has to be tested whether the considered variables are I(1). If the-variables are found to be I(1) they are stationary. This can be done in various ways: Dickey Fuller test, Augmented Dickey Fuller test, Phillips-Perron test etc. with trend or without trend, with or without intercept or both or none. This study applies Augmented Dickey-Fuller (ADF) test, which is based on the regression equation with an intercept and a trend in the form as follows:

$$\Delta Yt = a1 + a2t + bYt\text{-}1 + \sum_{..}^{k} \rho i \Delta Yt\text{-}1 + \varepsilon t \quad \text{----------(4)}$$

where, $\Delta Yt = Yt, - Yt\text{-}1$ and Y is the variable under consideration, k is the number of lags in the dependent variable, chosen by Schwarz information criterion and ε1 is the stochastic error term considering maximum 01 (one) lag period. The null hypothesis of a unit root implies that the coefficient of Yt-1 is zero. If the null hypothesis is rejected then the series is stationary and no differencing in the series is necessary to establish stationarity. The result is also further justified by Phillips and Perron (1988) test using Bertlett – Kernel estimation method with Newey-West Bandwidth. The results of these tests are presented in Table 2.

Table 2: Test for Cointegration

	Scharz info Criterion with intercept				With intercept				
Unit Root Tests									
	Augmented Dickey-Fuller Test				Phillips-Perron Test				
	Data on Level								
Variables	Lag Length	ADF Statistic	Crit. value at 1%	P-Value	PP Statistic	Estimation Method	Crit. Value	Bandwidth	P-Value
M0	1	-1.0166	-3.621	0.7373	-0.9848	Bartlett Kernel	-3.621	Newey-West Automatic	0.7486
M2	1	-1.8216	-3.6268	0.3645	-1.3067	,,	-3.621	,,	0.6162
NFA	1	-0.6277	-3.621	0.8522	-0.1303	,,	-3.621	,,	0.9385
GNB	1	1.6158	-3.621	0.9993	4.1796	,,	-3.621	,,	1.0000
	Data on First Difference								
	Lag Length	ADF Statistic	Critical value at 1%	P-Value	PP Statistic	Estimation Method	Estimation Method	Bandwidth	P-Value
M0	1	-5.1415	-3.6268	0.0002	-5.1528	Bartlett Kernel	-3.6268	Newey-West Automatic	0.0002
M2	1	-3.9596	-3.6268	0.0042	-4.0318	,,	-3.6267	,,	0.0035
NFA	1	-6.7633	-3.6329	0.0000	-14.3663	,,	-3.6268	,,	0.0000
GNB	1	-5.7748	-3.6211	0.0000	5.8013	,,	-3.621	,,	0.0000

Note: *** denotes the rejection of the null hypothesis at the 1% level.

Table 2 reveals that all the considered time series are non stationary in level form i.e. they are not 1(0) at their levels while the first difference made them stationary. That is each of the series are integrated of order 1 or simply they are 1(1). Both the ADF and the PP test provide the same result as shown in the table 1.

3.4 Testing for Co-integration

The second step to test the causality and co-integration involves searching for common stochastic trend between the concerned variables. Informally this can be understood from the graphical representation of the series as given in Figure l. The figure shows that all the series have an upward trend and moving in a synchronized way. Empirically this can be tested either by Engle-Granger two step co-integration procedures or by Johansen-Juselius test of co-integration techniques. We relied on Johansen-Juselius co-integration technique. In this technique two test statistics known as the trace statistic and the maximum eigenvalue are used to identify the number of co-integrating vectors. The Trace test statistic for the null hypothesis that there are at most r distinct co-integrating vectors is

$$ltrace = T \sum_{i=r+} \ln(1-lI) \quad \ldots\ldots(5)$$

where, lI's are the N-r smallest squared canonical correlations between Xt-k and ΔXt (where Xt = (gm1 or gm2 or gcpi)) and where all variables in Xt, are assumed 1(1)), corrected for the effects of the lagged differences of the Xt process.

The maximum eigenvalue statistic for testing the null hypothesis of at most r co-integrating vectors against the alternative hypothesis of r + l co-integrating vectors is given by

$$lmax = -T \ln(1-lr+1) \quad \ldots\ldots(6)$$

Johansen (1988) shows that equations (5) and (6) have non-standard distributions under the null hypothesis and provide approximate critical values for the statistic, generated by Monte Carlo methods. Considering linear deterministic trends of the data we have used options of trending and stochasticness of the series during estimation of the likelihood ratios in cointegration tests. As all data are yearly data we considered only one lag period for these tests. We have conducted both bilateral and multilateral contegartion test and results are shown in the following two tables:

Table 3: Johansen's test for multiple co-integrating vectors

			Trace Test		Maximum Eigen value Test	
Variables	Null Hypo	Alt. Hypo	Trace Statistic	Critical values at 1%	Max-Eigen value Statistic	Critical values at 1%
	H0	H1	LR		LR	
M0→M2	r= 1	r>1	36.27367	19.93711	25.06575	18.52001
	r<2	r>1	11.20791	6.634897	11.20791	6.634897
M0 →NFA	r= 0	r>1	50.70942	19.93711	33.30617	18.52001
	r<1	r>1	17.40325	6.634897	17.40325	6.634897
M0 →GNB	r= 0	r>1	46.43287	19.93711	29.27535	18.52001
	r<1	r>1	17.15752	6.63489	17.15752	6.63489

Table 3 reveals the Johansen's test for bi-variate and multiple co-integrating coefficients/ significance. Both the trace tests and maximum Eigenvalue tests suggest that the considered time series are significantly co-integrated. The likelihood ratios of these tests indicate that there is co-integration between many of the considered pairs and among the multiple series. So, the result indicates that there is a stable long run relationship among RM and BM, RM and NFA and RM and GNB in case of Bangladesh. In addition to that relationship between RM and its other components such as CONFP and CDMB are not reported here as they did not hatch positive cointegration results. So, adoption of appropriate monetary policy depends on controlling of GNB and NFA. We shall focus on those implications in details latter. Before going to Granger Causality tests and Error Correction Model to be sure about short run dynamics of concerned variables we want to briefly report the conintegration equation result:

GBM = 4.208094 GRM ……(1)

(0.12547)

GRM = 0.099590 GNFA ……..(2)

(0.06815)

GRM = 0.034771 GGNB……..…(3)

(0.06815)

From the cointegration result alluded in appendix we can have the above three cointegration Equations 1, 2 and 3 where standard errors are in parentheses. From these equations we can confirm that under 1% significance level all parameters are significant and pass the econometric test. These three equations show there is a long run relationship between BM and RM, RM and NFA of BB and RM and Government Borrowing. More over equation (1) explain that if growth rate of RM increases 1% growth rate of BM increases about 4.208% and growth rate of NFA of BB increases 1% growth rate of RM increases about at 0.1% and finally if GNB increases 1% RM increases 0.034%.

3.5 Granger Causality in the ECM-VAR

If there is co-integration between two or more series, there is stable long run equilibrium relationship between them. However, in the short run there may have disequilibrium. The error correction mechanism corrects for disequilibrium and ties the short run behavior to its long run value (Sargan, 1964). Empirically, if two series {Yt: t = 0,1....} and {Xj: t = 0,1....} are 1(1) process, then in general, Zt = Yt -, γX, is an 1(1) process for any number of γ. Nevertheless, it is possible that for some $\gamma \neq 0$, Zt, Y,- γXt is an 1(0) process. The co-integrating relationship Zt -- Yt - γX, represent a long run or equilibrium relationship between two variables. The notions of co-integration provide the basis for modeling both the short run and long run relationship simultaneously. A Vector Error Correction (VEC) Model is a restricted VAR Model designed for use with nostationary series that are known to be cointegrated. VEC Model is a model that is built with a specification so that it restricts the long run behabior of the endogenous variables to converge to their cointegrating

relationship while allowing for short run adjustment dynamics. Simply considering a two variable system with one cointegrating equation and with no lag difference terms the cointegrating equation should be as follows:

$$Yt = \beta Xt \ldots\ldots(6)$$

This co-integrating relationship between Yt and Xt implies according to Granger representation theorem (Engle and Granger, 1987) says that the relationship between the two variables can be expressed as the error correction mechanism as follows:

$$\Delta Y1 = \lambda 1Zt\text{-}1 + \sum_{i=1}^{m} \delta i\Delta Xt\text{-}1 + \sum_{i=1}^{n} \delta j\Delta Yt\text{-}1 + u1t \quad \ldots\ldots(7)$$

$$\Delta Xt = \lambda 2Zt\text{-}1 + \sum_{i=1}^{m} \xi i\Delta Xt\text{-}1 + \sum_{i=1}^{n} \zeta j\Delta Yt\text{-}j + u2t \ldots\ldots(8)$$

where, $Zt = Yt - \gamma Xt$, and u1t and u2t, are white noise error terms. In long run equilibrium these errors should zero. In these two equations, the series Yt and Xt are co-integrated when at least one of the coefficients $\lambda1$ or $\lambda2$ is statistically different from zero. If $\lambda1 \neq 0$ and $\lambda2 = 0$, then Xt will lead Yt in the long run. The opposite will occur if $\lambda2 \neq 0$ and $\lambda1 = 0$. If both $\lambda1 \neq 0$ and $\lambda2 \neq 0$, then feedback relationship exists between Yt and Xt. The coefficients δi's and ζi's represents the short run dynamics or speed of the adjustment between Yt and Xt. If δi's are not all zero, movements in the Xt will lead to Yt in the short run.

Table 4: Temporal causality results based on Granger causality

Dependent Variable	Significant Levels of t-statistic on ECM_{t-1}			
	GRM	GBM	GNFA	GGNB
GRM	…	4.899^{***}	6.572^{***}	5.914
GBM	7.918^{***}	…	5.928^{***}	5.198
GNFA	…	…	….	-2.249
GGNB	5.491^{***}	3.561^{***}	6.313^{***}	….

Note: ***, ** and * denote1%, 5% and 10% level of significance respectively.

Table 5: Vector Error Correction Model (F-statistic)

Dept. Variable	Significant Levels of F-statistic			
	GRM	GBM	GNFA	GGNB
GRM	…	7.611^{***}	2.749^{*}	2.867^{*}
GBM	…	…	…	…..
GNFA	4.265^{**}	…	…	….
GGNB	7.587^{*}	2.779^{*}	2.635^{*}	….

Note: ***, ** and * denote1%, 5% and 10% level of significance respectively.

Table 4 and 5 briefly indicate that in Granger sense there is both unidirectional and bidirectional causality among many of the important pairs of variables implying that expansionary monetary policy has important effect on both of the real and nominal sectors, which is showing coherence with many earlier studies in Bangladesh. This result is also in supported by the Johansen co-integration technique shown in table 2. Though in case of Error Correction Model (ECM) the speed of the error correction in short run is not reported in table the co-integration coefficients say the same result of Johansen co-integration technique. Precisely, the higher supply of money plays the vital role in Bangladesh for the development of other macroeconomic variables which we shall elaborately look in the next section of this paper.

4. Results

M2-M0 Causality: The hypothesis that causality is running from Reserve Money or Base Money (M0) to Broad Money (M2). The result is supported by Error Correction Model (ECM). The Post-Keynesian argument is that in the money creation process bank loan disbursed by the commercial banks is further caused of additional deposits and those new deposits of the commercial banks provokes the central bank to change the M0. The hypothesis is accepted and, hence, there is long run equilibrium between M0 and M2. The neoclassical argument is that the central bank wishes to control the overall liquidity situation in the economy so long as reserve money is kept at a level of consistent to the

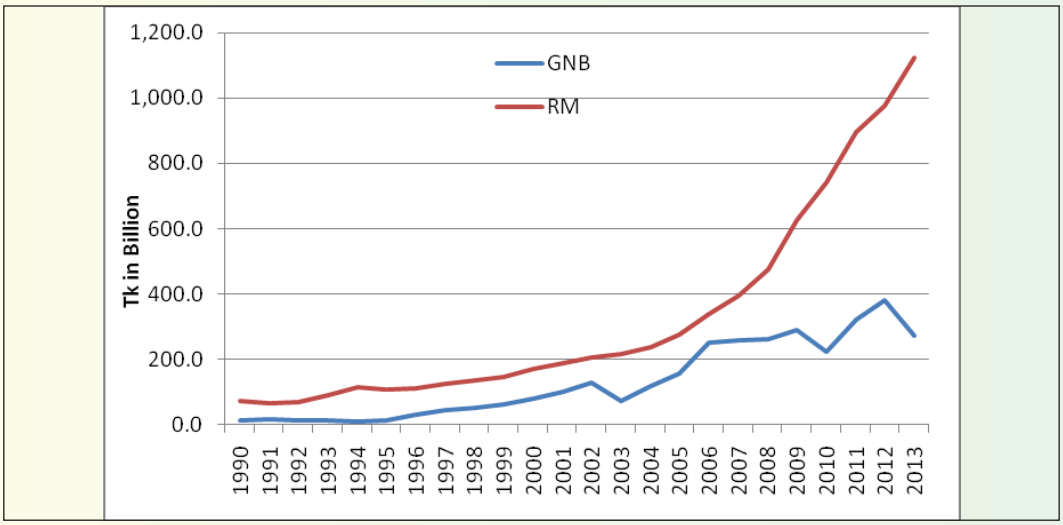

Figure 03: Nexus between GNB and RM in Bangladesh.

desired broad money expansion of the economy. As our hypothesis is accepted it means that BB has high level ability to influence the BM supply of Bangladesh by manipulation RM over the full concerned period.

M0-Government Credit from BB causality in Bangladesh: Government credit from BB is a major source of RM. Government credit is an autonomous component of RM as central bank

has no right to dishonor government borrowing demand. So, curbing money supply can be seriously hindered by the excessive and unplanned government borrowing particularly from the central bank. Such over borrowing of government is a direct cause of expansion of RM. Therefore, it is necessary to curb the government borrowing from BB to control money supply

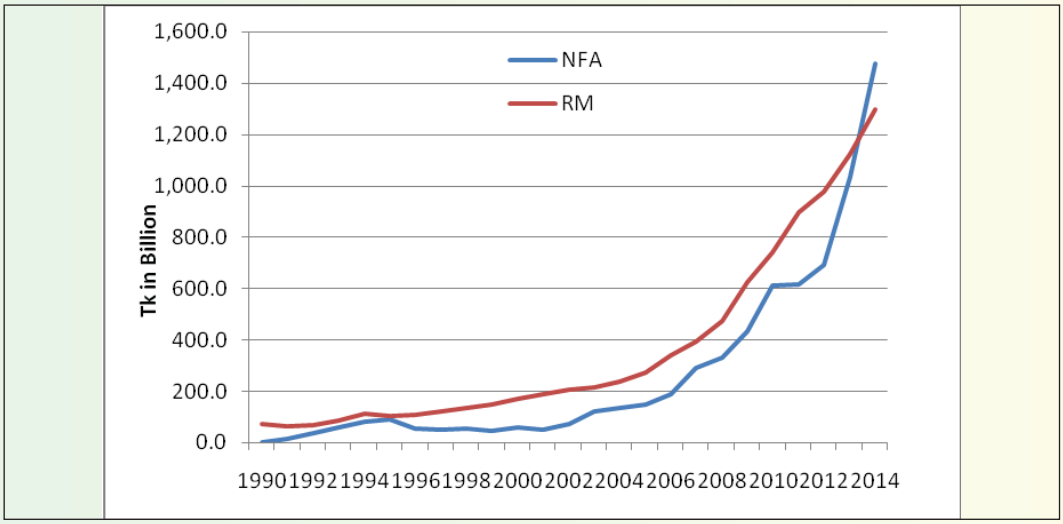

Figure 4: Nexus between NFA and RM in Bangladesh.

of the economy. According to the Johansen procedure of cointegration test we have got there is a log run equilibrium relationship between RM and GNB. As ECM model supports the result so there is a short run relation between them also may exist. The figure 3 says there is a similar movement between RM and GNB means that perhaps RM has strong linkage GNB.

NFA –M0 causality: The data shows that growth in NFA causes growth in RM. This result was strongly supported by both Granger Causality and ECM model. So the continuous autonomous growth in NFA has become an increasingly important determinant of RM growth in case of Bangladesh. RM has two components NFA and NDA. As NFA increases monetary base of the economy also increases and then BB takes steps to sterilize them by using its usual instruments. In case of an undesired expansion of NFA BB reduces NDA to curb the unintentional growth RM. This process will be fall in serious trouble if NDA tends to become a negligible part of RM due to the reckless expansion of NFA in the days to come. The figure 4 exhibits similar movement of RM and NFA means that they may have strong link which is supported by Johansen procedure of conintegration, ECM model and Granger causality techniques.

5. Policy Implications:

The results reported in the last section indicate that the findings have great importance in macroeconomic policy implications. It was evident in these results that RM and BM are highly cointegrated in case of Bangladesh and level of RM is strongly determined by the level of Government Borrowing and NFA of BB. So GNB and NFA of BB are strongly

endogenous in the money supply process for the concerned period in Bangladesh. This revealed endogeniety may be attributed to the large budget deficits, large trade deficits and big influx of foreign remittance after adoption managed floating exchange rate in 2004 which ultimately cause high growth of money stock in the economy. The consequences of this endogeniety briefly resultant the following policy implications:

BB works under the control of the government of Bangladesh. It is not independent like a central bank enjoys independence in a developed country. Nevertheless, it is independent in terms of policy initiation. So it can issue any instrument any time it wants. However, this power is gradually decaying as continuation autonomous increase of NFA is going on which is a big cautionary signal for BB for the days to come.

We have got that NFA Granger causes RM. Both ECM model and Johansen Cointegration tests has supported that NFA has both short run and long run relationship with RM. It means that effectiveness of monetary policy based on money supply control is thus seriously limited by autonomous and continuous growth of NFA. Gradual increase of NFA is making BB an instrumentally incapable central bank and losing sterilization power for coming days.

In case of Bangladesh government credit from BB is a robust source of RM. The result is jointly confirmed by the Johansen Cointegration, ECM model and Granger Causality Tests. It is also an autonomous component of RM in the sense that central bank cannot deny government cheques whenever they want borrow money from BB. There is a long run and short run equilibrium relationship between GB and RM. As the result is proved by Granger Causality test it evident that there is dynamic and causal link between GB and RM of the economy. So, curbing money supply is seriously hindered by the excessive and unplanned government borrowing particularly from the central bank over the concerned period and ultimately was a direct cause of expansion of RM. Therefore, empirically efficacy of monetary policy in Bangladesh is a subject to control of government borrowing from BB and continual increase of government borrowing is extremely detrimental for a successful monetary policy.

6. Conclusion

The major objective of the paper is to examine the dynamic and causal linkages between RM as well as BM with NFA of BB and GNB from BB over the period of 1975 to 2014. Applying unit root tests, Johansen cointegration test, error-correction models and Granger causality test through taking care of the stochastic properties of the regarded variables we have got very intuitive results. Many important policy implications can be inferred by the results of the study. Both short run and long run dynamics of the RM with GNB and NFA of BB have been tested and confirmed. So, the results provide several important useful insights especially for the monetary authority of the country. In this credit fixing regime of monetary policy post Keynesian claim is accepted by the econometric tests i.e. excessive GNB causes increase money supply of the economy. In the market oriented monetary policy regime period starting from early 1990s in which various financial sector reforms in the

name of structural adjustment: deregulation (i.e. decontrol of interest rates), liberalization (i.e. adopting Floating Exchange Rate) and privatization (i.e. giving permission of private banking) in the financial sector were undertaken keeping in thought about traditional neoclassical views and which were supported by our findings too. Reserve money (M0) is caused by domestic credit as well as inflow of foreign currencies (FC). The vast portion of literati of economics in Bangladesh is absolutely unaware about the process and efficacy of monetary policy in Bangladesh. So, the paper is a big contribution in the fulfilling of existing literature gap regarding monetary policy formulation and implementation process in case of Bangladesh as it is basically to the best of our knowledge the first output in its kind in the country.

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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 Objectives

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.

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