

*BBTA Journal*

**Thoughts  
on  
Banking and Finance**

**Volume 5 Issue 2  
July-December, 2016**



**Bangladesh Bank Training Academy**  
Mirpur-2, Dhaka-1216

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# BBTA Journal

## Thoughts on Banking and Finance

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## *Editorial Note*

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BBTA journal from its inception has successfully covered the research articles based upon Central Banking, Finance, Economics and related other areas. The current volume of the "BBTA journal: Thoughts on Banking and Finance" covers a broad spectrum of macroeconomic and financial issues that are most substantial to policymakers as well as researchers and academicians.

Topics included in this issue are: modeling and estimating volatility in the Dhaka Stock Market, bank credit and economic growth nexus: Bangladesh perspective, causality between budget deficit and interest rate: the case of Bangladesh, linking waste management with banking sector in Bangladesh: status and perception, real or nominal Shock- what drives the exchange rate movements in Bangladesh? dynamics of interest rate pass-through in Bangladesh: an econometric investigation for 2003 to 2015, and integrated marketing strategy and development of tourism sectors: a case of Bangladesh. Empirical examination of relevant theories on these issues is expected to provide valuable insights into the way policy makers think and make decisions. This issue also opens new avenues for scientific discourses and offers a concrete look at how these insights apply to development policy.

The first paper observed that financial market volatility has a wider impact on financial regulation, monetary policy and macro economy. The ARCH and GARCH models are used to estimate the volatility. Results show that volatility in the Dhaka Stock market depends on the past shock in the residual square and the past shock in the variance. The paper also highlighted some stylized facts in such DSE as volatility clustering, fat tails, persistence of volatility and mean that reverts the series under analysis. The findings of the study have useful implications for the regulator and policy makers in the Dhaka stock market.

The second paper delves into the impact of bank credit to the private sector on economic growth in Bangladesh from supply-side perspectives. The study has applied Johansen co-integration approach and Error Correction Model using the time series data for the period of 1980-2015. Estimation found a long run positive correlation between real private sector credits and real GDP. In the short run, real GDP adjusts towards the equilibrium path once the system is shocked. Hence, private sector credit should be considered carefully and given priority to productive sectors as unnecessary or unproductive credit to private sector not worthy to play active role to accelerate output growth.

The third paper inquire into the dynamic linkage between the budget deficit and interest rate in Bangladesh over a long period of time (1974-2014) by applying co-integration, error correction models and Granger causality tests. It is evident that the data series are integrated of order one. Then Johansen-Juselius technique established that the variables considered are co-integrated, implying that there is a stable long run relationship between

the two. The estimated error correction model reflects that the impact of budget deficit on interest rate is not instantaneous. The error correction model also manifests bidirectional causality between the variables, which is also supported by the Granger causality test.

The fourth paper focused that by ensuring proper waste management, it is possible to transform a large volume of waste into resources and produce remarkable positive impact on environment, operating cost and business income apart from ensuring employment. The study maps out that current status of banks in Bangladesh have received an appreciable attention in linking waste management till date.

The fifth paper investigates into the primary elements responsible for exchange rate movements of the US dollar against Bangladeshi Taka. The dynamic effects of real and nominal shocks are scrutinized through conducting a structural vector auto regression (SVAR) model of real and nominal exchange rates with the assumption of the long-run neutrality restriction of nominal shocks on real exchange rate. The authors decomposed exchange rate movements into two components, real and nominal factors that lead to exchange rate variation. This empirical analysis demonstrates that the effect of a real shock on the real and nominal exchange rate is of a persistent nature, resulting in a long-run real appreciation and the effect of a nominal shock on the nominal exchange rate reveals that nominal shock takes around five months to maintain negative direction (depreciation) in the nominal exchange rate in Bangladesh.

The sixth article employs vector Error correction models to examine the dynamics of the interest rate pass-through mechanism for Bangladesh, by formulating and using an independent variable 'weighted average policy rate' and lending rate, deposit rate and call money rate as dependent variables representing the lending, deposit and money market channels, respectively. The paper finds that there is a symmetric, incomplete and very sluggish pass-through in Bangladesh for all lending, deposit and money market channels. Analysis also observed the greatest impact on the lending rate channel (40 percent) in short-run, while the adjustment speed is very slow in all channels. The study observes weak interest rate pass-through in Bangladesh is due to non-reliance of Bangladesh Bank on interest rate instrument for implementation of monetary policy.

Finally, I would like to convey my heart-felt thanks and sincere gratitude to authors, reviewers, Editorial Advisory Board, and the members of the Editorial Board of BBTA Journal. Our efforts will be fruitful provided the articles published in this issue prove to be useful to readers. We appreciate constructive criticism and thoughtful feedback for further improvement of the Journal in future.



**Md. Mostafizur Rahman Sarder**

General Manager

Executive Editor

BBTA Journal: Thoughts on Banking and Finance

## Modeling and Estimating Volatility in the Dhaka Stock Market

Luthfe Ara Begum\*  
Nasrin Sultana  
Md. Shamim Mondal

### *Abstract*

*Volatility in the stock prices behavior is a normal phenomenon. This is a key element for pricing financial instruments. Financial market volatility also has a wider impact on financial regulation, monetary policy and the macro economy. Study use, daily closing prices data of “DSEX” Broad Index during January 28, 2013 to December 31, 2015. The ARCH and GARCH models are used to estimate the volatility and Phillip Parron test for stationary. Estimated results revealed that the volatility in the Dhaka stock market follow GARCH (1, 1) model i.e. volatility in the Dhaka stock market depends on the past shock in the residual square and the past shock in the variance. Estimated results also revealed its stylized facts volatility clustering, fat tails, persistence of volatility and mean reverting in the series under analysis. The results of the study have useful implications for regulators and policy makers in the Dhaka stock market.*

**Key Words:** Volatility, ARCH, GARCH, Mean Reversion.

**JEL Classification:** G12, G14

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" The Authors are Deputy General Manager, Joint Director and Deputy Director respectively of Monetary Policy Department, Bangladesh Bank. Views expressed in this paper are the authors' own and do not reflect the views of the Bangladesh Bank.

## Introduction

and is a sign of efficiency in stock markets. In an efficient market, stock price fully reflects all available information. Thus, stock price fluctuates in response to new information. The main problem with price fluctuation that affects the financial market efficiency is destructive excess volatility that ends up in crashes and/or crisis in the financial markets. Excessive volatility also reduces the usefulness of stock price as a reflector of the real worth of the firm. After changes in political regime and/or with the inauguration of new government in 1996, the stock market started rising without any connection to company fundamentals. The Dhaka Stock Exchange Index (DSEI) grew from 804 on 31 May 1996 to an all time high of 3596 on 17 November 1996 and then fell to 622.28 on 16 April 1998. Over the passage of time some significant developments took place in Dhaka Stock Exchange (DSE). Our capital market remained buoyant despite collapse of the capital market in many developed and developing countries during global financial crisis in 2007-08. The increasing trend of DSE General Index crossed the 3000 mark in January 2007 and it crossed 8187 points for the first time by the end of 2010. From the beginning of December 2010 market capitalization and share price index decreased gradually and was going to deep correction which continued up to the beginning of 2012 and reached at 3045 points in February 6, 2012. In such a situation, difference between stock intrinsic value and its related market value is significant and has several consequences.

In view of the rapidly increasing role of the stock market, volatility in stock prices can have significant implications on the performance of the financial sector as well as the entire economy. There exists important link between stock market uncertainty and public confidence in the financial market. The policy makers usually rely on the market estimate of volatility as the barometer of the vulnerability of the stock market. Stock return volatility represents the variability of day-to-day stock price changes over a period of time, which is taken as a measure of risk by the relevant agents. High volatility, accompanied by any change in the real situation, may lead to a general erosion of investors' confidence in the market and redirect the flow of capital away from the stock market. Volatility, however, is not an evidence of irrational market behavior or inefficient markets. Stock return volatility is usually asymmetric in its response to past negative price shocks compared with the positive shocks, but what factors drive volatility over time is not clear. Moreover, increase in firm-specific risk appears to adversely affect its stock valuation.

Hence, the study of financial asset volatility is important to academics, policymakers, and financial markets participants for several reasons. First, prediction of financial market volatility is important to economic agents because it represents a measure of risk exposure

in their investments. Second, a volatile stock market is a serious concern for policy makers because instability of the stock creates uncertainty and thus adversely affects growth prospects. Evidence shows that when markets are perceived as highly volatile it may act as a potential barrier to investing. Third, the stock market volatility causes reduction in consumer spending. Fourth, pricing of derivative, securities and pricing of call option is a function of volatility. Consequently, it can be seen that the study of stock market volatility and its characteristics is very important and can be helpful for formulation of economic policies and forming rules and regulations related to stock market.

An attempt has been taken in this paper to model and estimate volatility in the Dhaka Stock Exchange. We followed the model used in the paper titled Modeling and Estimation of Volatility in the Indian Stock market by Hojatallah Goudarze. The remainder of the paper is organized as follows: section 2 describes the volatility model; literature review is presented in section 3; methodology is analyzed in section 4; findings are explained in section 5; and finally concluding remarks is in section 6.

## 2. Models of volatility:

In modeling and capturing many of the stylized facts of the volatility behavior usually observed in financial time series including time varying volatility or volatility clustering (Zivot and Wang, 2006) ARCH models are being used widely.

The serial correlation in squared returns, or conditional heteroskedasticity (volatility clustering), can be modeled using a simple autoregressive (AR) process for squared residuals. For example, let  $y_t$  denote a stationary time series such as financial returns, then  $y_t$  can be expressed as its mean plus a white noise if there is no significant autocorrelation in  $y_t$  itself:

$$Y_t = c + \varepsilon_t \quad (1)$$

Where  $c$  is the mean of  $y_t$  and  $\varepsilon_t$  is iid with mean zero. To allow for volatility clustering or conditional heteroskedasticity, assume that  $\text{Var}_{t-1}(\varepsilon_t^2) = \sigma_t^2$  with  $\text{var}_{t-1}(\cdot)$  denoting the variance conditional on information at time  $t-1$ , and

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_p \varepsilon_{t-p}^2 \quad (2)$$

Since  $\varepsilon_t$  has zero mean,  $\text{Var}_{t-1}(\varepsilon_t^2) = \sigma_t^2$ , the above equation can be rewritten as:

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_p \varepsilon_{t-p}^2 + u_t \quad (3)$$

Since an ARCH model can be written as an AR model in terms of squared residuals as in equation 3, A simple Lagrange Multiplier (LM) test for ARCH effects can be constructed based on the auxiliary regression as in equation 3.

Under the null hypothesis that there is no ARCH effects:

$$H_0 = \alpha_1 = \alpha_2 = \dots \alpha_p = 0$$

the test statistics is  $LM = T.R^2 \sim \chi^2(p)$

Where  $T$  is the sample size and  $R^2$  is computed from the regression (3) using estimated residuals. If P-value is smaller than the conventional 5% level, the null hypothesis that there are no ARCH effects will be rejected. In other words, the series under investigation shows volatility clustering or persistence. If the LM test for ARCH effects is significant for a time series, one could proceed to estimate an ARCH model and obtain estimates of the time varying volatility  $\sigma^2$  based on the past history. A more parsimonious model proposed by Bollerslev (1986) replaces the AR model in (equation 2) with the following formulation:

$$\sigma^2 = \alpha_0 + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^q \beta_j \sigma_{t-j}^2 \tag{4}$$

The model in (equation 4) together with (equation 1) is known as the generalized ARCH or GARCH (p, q) model. When  $q=0$ , the GARCH model reduces to the ARCH model.

Under the GARCH (p, q) model, the conditional variance of  $\varepsilon_t \alpha_t^2$ , depends on the squared residuals in the previous p periods, and the conditional variance in the previous q periods. Usually a GARCH (1, 1) model with only three parameters in the conditional variance equation is adequate to obtain a good model fit for financial time series (Zivot and Wang, 2006).

### 2.1 ARCH effect test process

Consider the k-variable linear regression model.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + u_t$$

In addition, assume that conditional on the information available at time (t-1), the disturbance term distributed as

$$u_t \sim [0, (\alpha_0 + \alpha_1 u_{t-1}^2)]$$

That is,  $u_t$  is normally distributed with zero mean and

$$\text{Var}(u_t) = (\alpha_0 + \alpha_1 u_{t-1}^2)$$

That is the variance of  $u_t$  follows an ARCH(1) process. The variance of  $u$  at time  $t$  is dependent on the squared disturbance at time  $(t-1)$ , thus giving the appearance of serial correlation. The error variance may depend not only on one lagged term of the squared error term but also on several lagged squared terms as follows:

$$\text{Var}(u_t) = \sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 u_{t-2}^2 + \dots + \alpha_p u_{t-p}^2$$

The null hypothesis can be tested by the usual F test but the ARCH-LM test of Engle (1982) is a common test in this regard. Under ARCH-LM test the null and alternative hypothesis for DSEX broad stock index are as follows:

$$H_0: \alpha_1 = 0 \text{ and } \alpha_2 = 0 \text{ and } \alpha_3 = 0 \text{ and } \dots \alpha_q = 0$$

$$H_1: \alpha_1 \neq 0 \text{ and } \alpha_2 \neq 0 \text{ and } \alpha_3 \neq 0 \text{ and } \dots \alpha_q \neq 0$$

Null hypothesis in this case is homoskedasticity or equality in the variance. Acceptance of this hypothesis imply that, there is no ARCH effects in the under process series. In other word, the data do not show volatility clustering i.e. there is no heteroskedasticity or time varying variance in the data.

If an ARCH effect is found to be significant, then the specification of an appropriate ARCH model is necessary. In order to identify the ARCH characteristics in DSEX, the conditional return should be modeled first; the general form of the return can be expressed as a process of autoregressive AR(p), up to (p) lags, as follows:

$$R_t = \alpha_0 + \sum_{i=1}^q \beta_i R_{t-i} + \varepsilon_t$$

This general form implies that the current return depends not only on  $(R_{t-1})$  but also on the previous (p) return value  $(R_{t-p})$ .

The next step is to construct a series of squared residuals  $(\varepsilon_t^2)$  based on conditional return to drive the conditional variance. Unlike the OLS assumption of a constant variance  $(\varepsilon_t)$ s, ARCH models assumes that  $(\varepsilon_t)$ s have a non constant variance or heteroscedasticity, denoted by  $(h_t^2)$ . After constructing time series residuals, we have modeled the conditional variance in a way that incorporates the ARCH process of  $(\varepsilon^2)$  in the conditional variance with (q) lags.

The general forms of the conditional variance, including (q) lag of the residuals is as follows:

$$h_t^2 = \beta_0 + \sum_{i=1}^q \beta_i \varepsilon_{t-i}^2$$

The above equation is what Engle (1982) referred to as the linear ARCH (q) model because of the inclusion the (q) lags of the ( $\epsilon^2$ ) in the variance equation. This model suggests that volatility in the current period is related to volatility in the past periods.

To determine the value of q or the ARCH model order, we use the model selection criterion such as AIC (Akaike Information Criterion) and SBIC (Schwartz Bayesian Information Criterion). The decision rule is to select the model with the minimum value of information criterion. This condition is necessary but not enough because the estimate meets the general requirements of an ARCH model. The model to be adequate should have coefficient that all are significant. If this requirement meets then the specified model is adequate and fit the data well.

## 2.2 Mean Reversion

The high or low persistence in volatility is generally captured in the GRACH coefficient(s) of a stationary GARCH model, for a stationary, GARCH model the volatility mean reverts to its long run level, at rate given by the sum of ARCH and GARCH coefficients which is generally close to one for a financial time series.

## 3. Literature Review

Volatility in the stock prices behavior is a normal phenomenon but what causes stock prices volatility is a question that remains unsettled in the finance field. After introducing ARCH model by Engle (1982) many studies accomplished in developed country and to some extent in developing country. Of these a few studies has been reviewed here.

Kim and Singal (1993) suggested that there were no increase in volatility over time, and that volatility tended to decrease following market liberalization. Engle and Ng (1993), estimated the impact of bad and good news on volatility. Market volatility is assumed to be associated with the arrival of news. They found an asymmetry in stock market volatility for bad news as compared to good news Bad news is associated with sudden drop in price while good news is associated with sudden rise in price. They found that bad news create more volatility than good news of equal importance. This asymmetric characteristic of market volatility has come to be known as the “leverage effect”. Engle and Ng (1993) provided new diagnostic tests and models, which incorporate the asymmetry between the type of news and volatility. Fouque et al (1999), presented a derivative pricing and estimation methodology for a class of stochastic volatility models that exploits the observed persistent nature of stock price volatility. Empirical analysis of high frequency S & P 500 index data for European option prices confirms that volatility

reverts slowly to its mean in comparison to tick-by-tick fluctuations of the index value, but it is fast mean reverting when looked at over the time scale of a derivative contract. Batra, A. (2004) examined the time variation in volatility in the Indian stock market during 1979-2003. Using monthly data and asymmetric GARCH methodology augmented by structural change analysis, the paper revealed that the period around the BOP crisis and the subsequent initiation of economic reforms in India was the most volatile period in the stock market. Stock return volatility in India seems to be influenced more by domestic political and economic events rather than by global events. The analysis in the paper also revealed that stock market cycles in India have not intensified after financial liberalization. A generalized reduction in stock market instability was observed in the post-reform period in India. Banerjee and Sarkar (2006), in the article “long memory property of stock return; evidence from India” investigated the presence of long memory in asset returns in the Indian stock market. They found that although daily returns are largely uncorrelated, there is strong evidence of long memory in its conditional variance. They concluded that FIGARCH is the best-fit volatility model and it outperforms other GARCH type models. Goudarzi (2013), using daily data for the period 2000 to 2010 showed that Indian stock market are characterized by mean reversion and inconsistent with the efficient market hypothesis. This evidence shows that Indian stock market to be informationally weak-inefficient. He suggested that to improve the efficiency of the market and secure the flow of information to the market participants, the policy makers must take this into account to prevent any speculation which may affect the intrinsic value of the share and cause crashes and/or crises.

There are few studies on the volatility of Dhaka stock exchange. Some of the studies are reviewed here. Haque et al (1998), examined whether the introduction of automated trading along with the changes in regulatory measures changed the risk return composition and thus improved the market efficiency of the DSE. They concluded that the DSE at best can be considered as weak-form efficient and the automation and other regulatory measures have done little or nothing at all to change the risk return composition of the market. Within the GARCH type framework Basher et al. (2007) investigated the time varying risk-return relationship and the impact of institutional factor on the volatility of stock return in Bangladesh using daily and weekly DSE stock return. Capital market in Bangladesh has gone through a structural change in 1990s when foreign investors were allowed to invest in the capital market. The DSE returns showed negative skewness, excess Kurtosis and deviation from normality. In addition to this, the DSE returns exhibited serial correlation indicating stock market inefficiency. They found a significant

relationship between conditional volatility and DSE stock return. They also found that lock-in has no significant impact on stock volatility, while, circuit breaker has some influences on the volatility of daily and weekly stock return for both pre-and post-liberalization samples. They suggested that in order to improve the operation of the capital market the government should emphasis a policy of timely disclosing and disseminating the information to the investors and stakeholders on the performance of listed companies. Imam and Amin (2004) found that volatility in the return of capital market in Bangladesh follows a generalized autoregressive conditional heteroskedastic (GARCH) process. It has been observed that the volatility predicted this period has more influence in forecasting volatility for the next period. Dhaka Stock Market today's return has a large effect on the conditional forecast variance many periods in the future, indicating, for the DSE return series, volatility clustering is said to be persistent. The GARCH model exhibits different results for two sub-periods of pre-crash and post-crash period. High volatility in the later period as well as the change in the behavior of investors after the stock market crash in 1996 are the reasons for the structural shift in the GARCH process. Lack of confidence by the long term individual investors, passive role run by institutional investors, and the dominance of speculators are the major reasons for the change in investor's behavior. They found that conditional volatility of DSE index in post-crash period is mean reverting. This finding suggests that current information has no effect on long run forecasts and volatility shocks (random error) influences more in estimating future volatility than the volatility estimated at earlier period. Rahman and Hossain (2007) examined the stock price volatility in the Dhaka stock Exchange (DSE) for the period of 2003-2007. They showed that Dhaka stock Exchange market experiences excessive volatility in this period that comes from both the supply side and demand side factor, while supply side variables (issued capital) fluctuates less than demand side variables, market capital. They found that demand side pressure (upward price adjustment) had contributed to the volatility of stock of index during the year of 2003, 2004 and 2007, while excess sharp fall in price index in the year of 2005 and 2006 had come from excess supply of shares. They recommended that active participation of the government through issuing supply of stocks can help to mitigate the excessive volatility in the capital market. However, identifying the factors behind price movement and disseminating the information to the investors are necessary to handle the situation during the unpredicted price movement period. Using monthly DSE General Index for the period of January 1987 to March 2010 Rayhan et al. (2011) found that monthly DSE return follow Generalized Autoregressive Conditional Heteroskedasticity (GARCH) properties. Islam et al. (2012) examined the relative ability of various models to find out the best forecasting model for

Bangladesh. They found that linear models dominate over non-linear models for forecasting stock index future volatility and they suggested that moving average model appears to be the best in this regard. This study is different from other studies as unlike other studies, this study use daily ‘DSEX’ broad index for the period 2013 to 2015. And also has made an attempt for modeling and estimating volatility in the Dhaka stock market.

#### 4. Methodology

The DSE Broad Index (“DSEX”) with effect from January 28, 2013 which reflects around 97 percent of the total market capitalization has been used in the study. Daily closing prices data of “DSEX” Broad Index during January 28, 2013 to December 31, 2015 is obtained from Dhaka Stock Exchange. A continuous sequence of 764 observations of closing price data is gathered over the last three years period. The logarithm of price relatives of DSEX indices ( $p$ ), is used to calculate the price changes of DSEX returns ( $r$ ). That is at time  $t$  the daily DSEX return is  $r_t = \log(P_t/P_{t-1})$ . Visual inspection of the plot of residual of daily return series of DSEX indices shows that return fluctuates around mean value that is close to zero (chart 2). The ARCH and GARCH models are estimated for DSEX return series assuming the student  $t$  – distribution. We use information criteria such as AIC and SBC values, and model diagnostic tests (ARCH-LM test and Q-Statistics) to choose the volatility model which represents the conditional variance of the DSEX broad index series appropriately. We estimate the model using Eviews 9.

#### 5. Results and discussions

The distributional properties of daily DSEX index return are reported in Chart 1. The mean daily return is 0.000162, the volatility (measured as a standard deviation) is 0.009463. There is indication of negative skewness (-0.131) , which indicates that the lower tail of the distribution is ticker than the upper tail, that is, the index declines occur more often than its increases. The kurtosis coefficient (5.759) is positive, having high value for the return series, that is, the pointer of leptokurtosis or fat tailness in the underlying distribution. Under the null hypothesis of normality the Jarque- Bera statistics asymptotically follows a Qi-square distribution. The computed value of 244.09 with P-value of zero rejects the normality assumption due to the high kurtosis indicating fat tail. The chart 2 shows volatility clustering where large returns tend to be followed by small returns leading to continuous periods of volatility and stability. Volatility is high for certain time periods and low for other periods. The movements are in the positive and negative territory and large fluctuations tend to cluster together separated by periods of

relative calm. The volatility was highest throughout the year 2013 and second quarter of 2015. Q-Q plot in chart 3 also confirm the non-normality of the return series.

To detect the presence of ARCH effect in the mean equation of DSEX broad index we use ARCH-LM (Lagrange Multiplier) test. We tested for ARCH effect for higher order and found that coefficient of  $\varepsilon_{t-4}^2$ ,  $\varepsilon_{t-6}^2$ ,  $\varepsilon_{t-7}^2$ , and  $\varepsilon_{t-9}^2$  are statistically insignificant. ARCH-LM test is statistically significant which indicates the presence of ARCH effect in the residuals of mean equation of DSEX broad index (Table-1). To determine which ARCH model is adequate for describing the conditional heteroskedasticity of the data we apply sample ACF and PACF of the squared residuals which showed the existence of ARCH effects. The PACF indicated that an ARCH (3) model might be appropriate. Consequently, we specify the ARCH (3) model as follows:

$$r_t = \mu + \alpha_1 r_{t-1} + \varepsilon_t$$

$$\sigma^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2$$

The result for the ARCH (3) for daily log return of DSEX broad index is reported in (Table-2). As table-2 shows that the estimates of  $\alpha_1$ ,  $\alpha_2$  and  $\alpha_3$  are all statistically significant at the 1% level of significance. Therefore, the model needs not to be simplified. Therefore, we choose ARCH (3) for our data set of DSEX broad index. Using AIC, SBC, Hannan-Quinn model selection criterion we achieved same results.

To test the adequacy of the model we applied the ARCH-LM test up to three lag. The result has reported in the Table-3. As Table-3 indicates, both test statistics are statistically insignificant. It means no ARCH effect left in the model. Thus, we found that ARCH (3) can be possible representation of the conditional volatility process for daily return series of DSEX broad index. Hence, we obtain the following fitted model for mean and variance equations.

$$r_t = 0.00025 + 0.141474 r_{t-1} + \varepsilon_t$$

$$\sigma^2 = 3.88E-05 + 0.149559 \varepsilon_{t-1}^2 + 0.252418 \varepsilon_{t-2}^2 + 0.166072 \varepsilon_{t-3}^2$$

### GARCH Model:

Although the ARCH model is simple, it often requires many parameters to adequately describe the volatility process of an asset returns. Bollerslev (1986) proposes a useful extension known as the generalized ARCH (GARCH) model. The modeling process of ARCH model can also be used to build a GARCH Model. However, specifying the order of GARCH model is difficult. For this reason, only lower order of GARCH models are used in most application. We fit the GARCH models with different orders (up to 5) to the DSEX daily return series. To select the order of GARCH model, we used SBC criteria as

SBC select the parsimonious model. The model with lower value of SBC fits the data best. The results are presented in Table 4. As Table-4 shows, the SBC value is lowest for  $p = 1$  and  $q = 1$ . Therefore, we choose GARCH (1, 1) for our data set of DSEX broad index. Thus we found that GARCH (1, 1) can be possible representation of the conditional volatility process for daily return series of DSEX broad index. Table-5 reports the statistics regarding GARCH (1,1). To test the adequacy of GARCH (1,1) model we apply ARCH-LM test up to 10 lag. The results of ARCH-LM test are reported in Table-6. As results shows the F-Statistics and obs\* R squared statistic both are insignificant and indicating no ARCH effect left in the series.

Thus, we employed GARCH (1, 1) to model volatility. The model of volatility for DSEX broad index using GARCH (1, 1) are as follows:

$$r_t = 0.000243 + 0.131874 r_{t-1} + \varepsilon_t$$

$$\sigma^2 = 3.09E-06 + 0.150804 \varepsilon_{t-1}^2 + 0.817553 \sigma_{t-1}^2 + \varepsilon_t$$

As above model indicates the value of  $\alpha$  is 0.150804 and the value of  $\beta$  is 0.817553, the sum of parameters ( $\alpha + \beta$ ) is 0.97. The stationary condition ( $\alpha + \beta < 1$ ) is satisfied. The mean reverting rate ( $\alpha + \beta = 0.97$ ), implied by our fitted model is close to one. Therefore, the fitted GARCH model implies that conditional volatility is very persistent. A large value of GARCH lag co-efficient  $\beta$  (0.817553) indicates that shocks to conditional variance takes a long time to die out, so the volatility is persistent. Low value of error coefficient  $\alpha$  i.e. (0.150804) suggests that large market surprises induce relatively small revision in future volatility. The sum of  $\alpha$  and  $\beta$  is close to unity ( $\alpha + \beta = 0.97$ ), a high value of this kind implies a “long memory” in the stock market. The stationary condition of ( $\alpha + \beta < 1$ ) implies that it is mean reverting and volatility finally revert to its long run average.

## 6. Conclusions

The study attempted to model and estimate volatility in the Dhaka stock market and its stylized facts. The study used 764 observations of daily closing price of DSEX broad index for the period January, 2013 to December, 2015. The analysis showed that the stock market volatility changes significantly over time. Empirical results showed that the volatility in the Dhaka stock exchange follow GARCH (1, 1) model. That is, volatility in the Dhaka stock market depends on past shock in the residual square and past shock in the variance. Our results revealed that GARCH (1, 1) model adequately describe the DSEX broad index and its stylized facts volatility clustering, fat tails and mean reverting in the series under analysis. The results suggest that the volatility in the Dhaka stock market exhibits the persistence of volatility and mean reverting behavior.

**Table - 1. ARCH-LM test of DSEX broad index log returns series to 36 lags**

| ARCH - LM TEST |          |             |     |
|----------------|----------|-------------|-----|
| F-statistics   | 5.359774 | Probability | 0.0 |
| Obis*R-Squared | 158.833  | Probability | 0.0 |

**Table - 2. ARCH(3) model parameters**

| ARCH (3) model parameters |             |           |              |        |
|---------------------------|-------------|-----------|--------------|--------|
| Mean Equation             |             |           |              |        |
|                           | Coefficient | Std.Error | Z-Statistics | Prob.  |
| C                         | 0.00025     | 0.000297  | 0.841921     | 0.3998 |
| AR(1)                     | 0.141474    | 0.036064  | 3.922873     | 0.0000 |
| Variance Equation         |             |           |              |        |
| C                         | 3.88E -05   | 3.55E -06 | 10.91455     | 0.0000 |
| ARCH(1)                   | 0.149559    | 0.038318  | 3.903131     | 0.0001 |
| ARCH(2)                   | 0.252418    | 0.046878  | 5.384566     | 0.0000 |
| ARCH(3)                   | 0.166072    | 0.05716   | 2.905382     | 0.0037 |

**Table - 3. ARCH-LM test for ARCH(3) model upto 3 lag**

| ARCH (3) TEST   |          |             |        |
|-----------------|----------|-------------|--------|
| F-statistics    | 0.300133 | Probability | 0.8253 |
| Obis*R -Squared | 0.904093 | Probability | 0.8244 |

**Table - 4. SBIC for different GARCH model**

| Comparisons of the SBC for the GARCH(p,q) model with different combinations of p and q for DSE Index |           |           |           |           |           |
|--|-----------|-----------|-----------|-----------|-----------|
| P  | 1         | 2         | 3         | 4         | 5         |
| q  |           |           |           |           |           |
| 1  | -6.674286 | -6.669133 | -6.660691 | -6.652413 | -6.644508 |
| 2  | -6.667529 | -6.660531 | -6.653509 | -6.648673 | -6.638282 |
| 3  | -6.660897 | -6.652497 | -6.655078 | -6.646544 | -6.637855 |
| 4  | -6.657363 | -6.653713 | -6.646567 | -6.637893 | -6.62506  |
| 5  | -6.648875 | -6.653386 | -6.646339 | -6.638053 | -6.643303 |

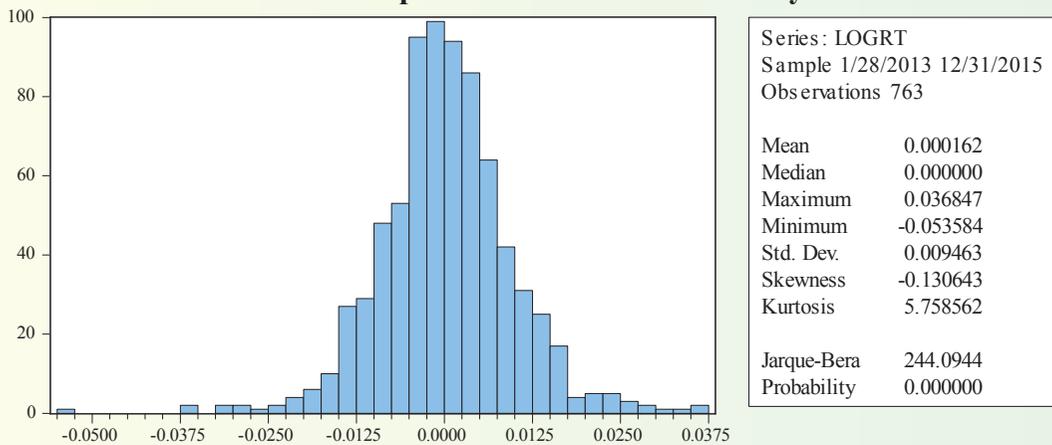
**Table - 5. GARCH (1,1) parameters**

| GARCH (1,1) Parameters |             |            |              |        |
|------------------------|-------------|------------|--------------|--------|
| Mean Equation          |             |            |              |        |
|                        | Coefficient | Std. Error | Z-Statistics | Prob.  |
| C                      | 0.000243    | 0.000279   | 0.870689     | 0.3839 |
| AR(1)                  | 0.131874    | 0.039843   | 3.309825     | 0.0009 |
| Variance Equation      |             |            |              |        |
| C                      | 3.09E -06   | 1.15E -06  | 2.67655      | 0.0074 |
| ARCH(1)                | 0.150804    | 0.023346   | 6.459432     | 0.0000 |
| GARCH(1)               | 0.817553    | 0.029406   | 27.80227     | 0.0000 |

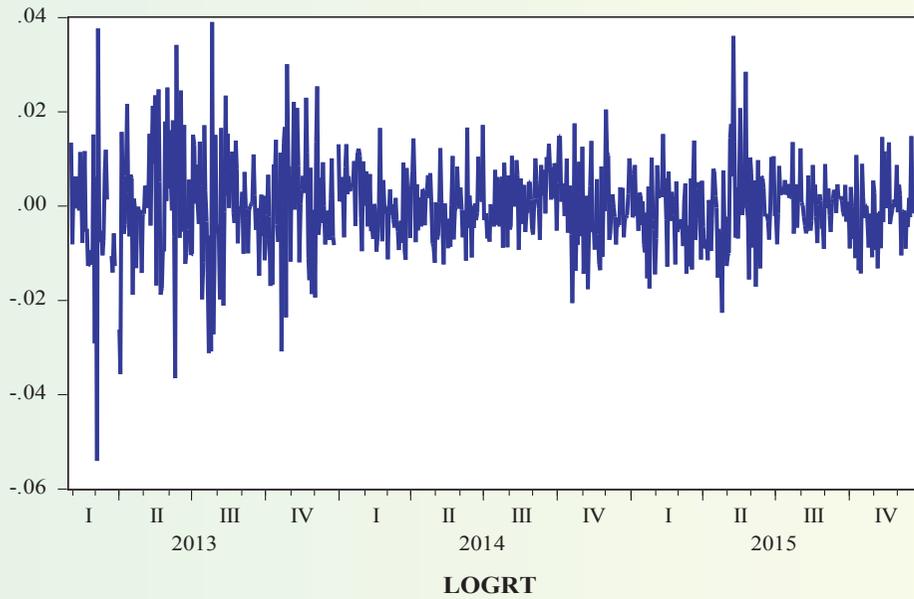
**Table - 6. ARCH-LM test for GARCH (1,1) model up to 10 lag**

| ARCH (10) TEST |          |             |        |
|----------------|----------|-------------|--------|
| F-statistics   | 0.818878 | Probability | 0.6105 |
| Obs*R -Squared | 8.219511 | Probability | 0.6074 |

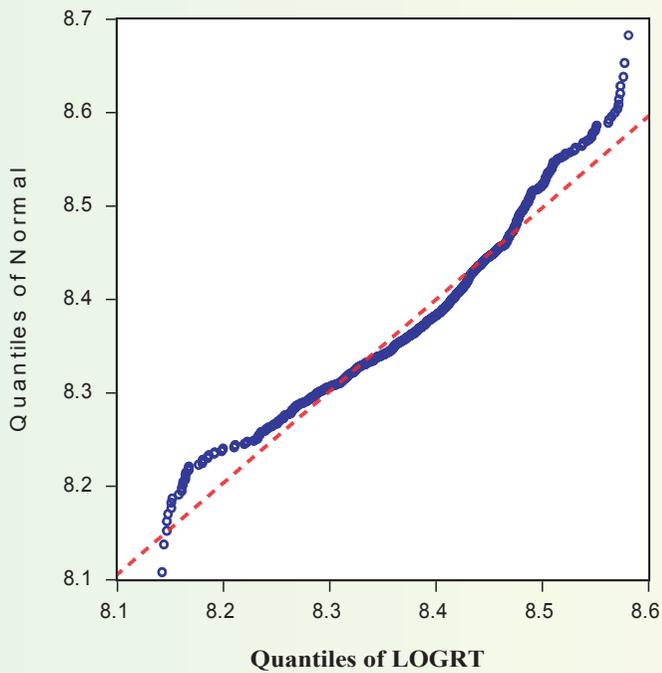
**Chart -1. Descriptive Statistics of DSEX Daily Return**



**Chart - 2. The Residuals of DSEX Daily Return**



**Chart -3. Q-Q plot of DSEX Daily Return Series**



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## Bank Credit and Economic Growth Nexus: Bangladesh Perspective

-Bishnu Pada Biswas  
-Mohammad Masuduzzaman

### *Abstract*

*This study examines the impact of bank credit to the private sector on economic growth in Bangladesh from supply side perspectives. The study has applied Johansen co-integration approach and Error Correction Model using the time series data for the period of 1980-2015. Based on the sample data and methodology, we found that there is a positive long run relationship between real private sector credit and real GDP. More specifically private sector credit can alone explain 40 percent of variation of GDP in the long run in Bangladesh. But in short run, real GDP adjusts toward the equilibrium path once the system is shocked. However, in the short run, the adjustment path of real private sector credit to maintain the long run relationship is somewhat opposite towards equilibrium. This means that in the short run, changes in real private sector credit cannot contribute positively to restore the long run relationship if there is an imbalance in the system. So, private sector credit should be considered cautiously and given priority to productive sectors as unnecessary or unproductive credit to private sector unable to play active role to accelerate output growth.*

**Key Words:** Economic Growth, Bank Credit, Co-integration

**JEL Classification:** C22, E23, G21, O53

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## 1. Introduction

The economic growth is considered as one of the major objectives of macroeconomic policy of a country. It is the important way of upgrading living standards of the country's people as well as achieving economic development.

Bank credit is considered as one of the key elements to economic growth particularly in developing countries as it lubricates the economy. Therefore, the role of bank credit on economic growth is widely accepted by policy makers as well as economic agents who ultimately invest money in various investment windows. Bank credit has a significant relation in monetary transmission as it provides finance in production, consumption and capital formation which in turn affect economic growth particularly in developing countries like Bangladesh. However, the relationship between bank credit and economic growth needs to be assessed properly.

The commercial banks provide bank credit to individuals, business organisations/industries and government for consumption and investment purposes. Individuals borrow money basically for consumption while business organisations/industries borrow for investing in plants and machineries and government borrows for development expenditure. Credit is understood as the provision of resources such as granting a loan by the creditor/lender to the debtor/borrower where the debtor does not reimburse the lender immediately, thereby generating a debt, and instead arranges either to repay or return those resources at a later date (Mishra et al, 2009).

Bangladesh Bank (BB) formulates monetary policy with a view to accelerate economic growth in Bangladesh. BB's policy guidelines and directives to commercial banks show the way to lend money to productive sectors (agriculture, energy and industry) for increasing output. In the credit channel, money supply increases reserves and deposits in banks and thus increases the quantity of available bank loans. This increase of loans will ultimately increase investments by borrowers who are usually dependent on bank loans to finance their projects. In this regard, the role of credit provided by the banks to private sector is considered more efficient to support economic growth rather than the credit provided to government.

The main objective of this study is to examine the effects of commercial banks' lending to private sector on economic growth and to suggest proper ways of lending money to the sectors which foster production and help achieving higher economic growth in Bangladesh. We will investigate short-run and long-run relationships between private sector credit and GDP using cointegration with Vector Error Correction Models.

The remainder of paper is structured as follows. After introduction the second section describes the literature review containing theoretical framework and empirical findings. The third section reviews the status and trend of bank credit to private sector. The fourth section presents the methodology and the fifth section shows empirical results of the study. The last section concludes the policy paper with recommendation.

## **2. Literature Review**

A vast literature on the issue exists with varying and often contradicting views. The study categorizes the literature into theoretical and empirical variant of literatures.

### **2.1 Theoretical Framework**

There are numerous growth models in theoretical literature. Some of these growth models are-Two-Gap Model, Marxian Theory, Schumpeterian Theory, Harrod-Domar Growth Model, Neo-Classical Model of Growth and Endogenous Growth Theory. The growth models explaining the situation in developing economies are basically Neo-Classical Growth Model and Endogenous Growth Theory.

### **2.2 Neo-Classical Growth Model**

The neo-classical model of growth was first designed by Robert Solow. The model shows that a sustained hike in capital investment increases the growth rate only temporarily. This is because the ratio of capital to labour goes up (there is more capital available for each worker to use) but the marginal product of additional units of capital is assumed to decline and the economy eventually moves back to a long-term growth path, with real GDP growing at the same rate as the work force plus a factor to reflect improving "productivity". A "steady-state growth path" is reached when output, capital and labour are all growing at the same rate, so output per worker and capital per worker are constant. Neo-classical economists believe that to raise an economy's long term trend rate of growth requires an increase in the labour supply and an improvement in the productivity of labour and capital. Differences in the rate of technological change are said to explain much of the variation in economic growth between developed countries. (Greenwood, J. and Jovanovic, B. 1990).

According to Estrada, G., Park, D. and Kamayandi, A. (2010), based on Solow's analysis of the American data from 1909 to 1949, they observed that 87.5% of economic growth within the period was attributable to technological change and 12.5% to the increased use of capital. The result of the growth model was that financial institutions had only minor influence on the rate of investment in physical capital and the changes in investment are viewed as having only minor effects on economic growth.

Neo-classical Growth Theory by Mankiw, Romer and Weil (1992) narrates that labor and capital are the major factors of production. For example,

$$y = f(K,L)$$

where Y denotes aggregate output, K denotes aggregate capital stock, and L is the labor force.

If technology and human capital are added, then equation will like a Cob-Douglas production function and stated as follows:

$$y = AK^\alpha L^{1-\alpha}$$

Bank credit facilitates to acquire more capital in this production function. When a new technology is available, the labor and capital need to be adjusted to maintain growth equilibrium. To obtain new technology and thus to increase total factor productivity, the role of credit provided by banks would be of immense assistance. Private sector credit fosters growth both through acceleration in investment and a productivity channel. The capital accumulation channel is important for underdeveloped and emerging countries. In standard neoclassical theories investment-savings is the main engine of economic growth. However these models assume that savings convert directly to investment and thus finance affects GDP growth primarily through capital deepening (Papaioannou, 2007).

### 2.3 Endogenous Growth Theory

Endogenous growth theory was developed in the 1980s by Femi Kayode, O.F., Edun, A.T. and Obamuyi, T.M. (2010), Johansen, S. (1988), Onuorah, A.C. and Ozurumba, B.A. (2013) among other economists as a response to criticism of the neo-classical growth model. The endogenous growth theory holds the view that policy measures can have an impact on the long-run growth rate of an economy. The growth model is one in which the long-run growth rate is determined by variables within the model, not an exogenous rate of technological progress as in a neoclassical growth model.

In an endogenous growth model, Estrada,G.,Park, D. and Kamayandi, A. (2010) observed that financial development can affect economic growth in three ways, which are: raising the efficiency of financial intermediation, increasing the social marginal productivity of capital and influencing the private savings rate. This means that a financial institution can affect economic growth by efficiently carrying out its functions, among which is the provision of credit.

### 2.4 Empirical Literature

A large body of literature is available on the extensive empirical work with regard to the nexus between bank finance and economic growth.

The German economist Schumpeter(1952) argued that banks mobilize and channel funds efficiently which provide the necessary credit to entrepreneurs to finance investment in physical capital, adopt new production techniques, thereby, spurring technological innovation and setting the stage for a creative production process. Gurley and Shaw (1967), Goldsmith (1969), Jayaratne and Strahan (1996), Kashyap and Stein(2000), Beck et al.(2000,2003), Driscoll (2004) etc, found that financial development can foster economic growth by raising saving, improving allocative efficiency of loanable funds, and promoting capital accumulation. In their opinion, well developed financial markets are necessary for the overall economic advancement of the less developed and the emerging economies.

Greenwood and Jovanovic (1990) showed that financial intermediation promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides the means to implement costly financial structures. Pagano (1993) revealed that financial intermediation can affect economic growth positively by acting on the savings rate, on the fraction of saving channeled to investment, or on the social marginal productivity of investment.

King and Levine (1993) provided the evidence that financial sector proxied by the ratio of bank credit granted to the private sector to GDP, affects economic growth both through the improvement of investment productivity (better allocation of capital) and through higher investment level. Financial system could impact positively on real economic performance by affecting the composition of savings (Bencivenga and Smith, 1991) and affecting the scope for credit rationing (Boyd and Smith, 1997).

Bayoumi and Melander (2008) found that a 2.5 percent reduction in overall credit caused a reduction in the level of GDP by around 1.5 percent. Dey and Flaherty (2005) used a two stage regression model to examine the impact of bank credit and stock market liquidity on GDP growth. They found that banking development is significant determinant of GDP growth. Monetary policy may affect real economic activity, and ultimately inflation, via its impact on the banking sector credit through a number of transmission channels (Brunner and Meltzer, 1963 and Bernake, 1983).

Mixed results was found by Esso (2010) in a study that re-examine the co- integrating and causal relationship between financial development (ratio of private credit to GDP) and economic growth in the Economic Community of West African States (ECOWAS) over the period 1960-2005. The results show that there is a long-run relationship between financial development and economic growth but with different direction of causality. Zhang, Wang and Wang (2012) [42] examine the relationship between financial intermediation and economic growth in China, using data from 286 Chinese cities over

the period 2001-2006. Their results suggest that traditionally used indicators of financial development are generally positively associated with economic growth after controlling for many factors associated with growth.

Applying Johansen co-integration approach and estimating Error Correction Model, Neelam Timsina (2014) found that the banks credit to private sector has positive impact on economic growth only in the long run. The empirical results imply that, policy makers should focus attention on long run to promote economic growth such as development of modern banking sector, efficient financial market, infrastructures so as to increase private sector credit which is instrumental to promote growth in the long run.

Garba Salisu Balago (2014) shows that bank credit variables have a positive effect on the economic growth of Nigeria and there exists a long-run relationship between the variables. The result suggests that, the credits to services sector that is usually considered as the less-preferred sector compared to production sector contribute more to the economic growth than production sector.

Iwedi Marshal et al (2015) showed the evidence for strong and positive correlation between credit to the private sector and GDP and between CGS and GDP in the short run. The study recommends that policy makers should fashion out appropriate policies that will enhance the bi-directional flow of influence between the banking sector where investable funds are sourced and the real sector of the economy where goods and services are produced. There should be efficient and effective utilization of borrowed funds in order to achieve the nominated objective of investment, productivity and economic growth.

Islam et al (2004) examined the critical issue of causality between financial development and economic growth in Bangladesh. In aggregate, the empirical evidence showed causality running from economic growth to financial development in Bangladesh. The empirical results of this study clearly demonstrate that there is no such evidence of causal direction from financial development to economic growth in Bangladesh, rather growth led financial development has possible dominance.

However, the relationship between private sector credit and economic growth has not yet been assessed properly in the Bangladesh context. In this regard, this study attempts to fulfill the gap.

### **3. The Status and Trend Analysis of Private Sector Credit**

After independence, the banking sector of Bangladesh was nationalized and economy was liberalised from early 1980s. Few years later, Bangladesh launched a broad based

program of reforms- Financial Sector Reform Program (FSRP) from early 1990s. But the financial sector of Bangladesh witnessed some policy changes. Although the major issues addressed by FSRP includes interest rate liberalization, loan classification and provisioning, capital adequacy, legal reforms, strengthening of central bank and bank supervision, improving operational efficiency of commercial banks and reforms in foreign exchange regime and so on. But the targets were not fully achieved. The existence of increasing non-performing loan in the banking sector particularly in State-owned Banks and Development Financial Institutions encouraged high interest margin (spread) which played role of low level of financial intermediation in Bangladesh. Moreover, lack of diversification of financial instruments, higher transaction cost and political unrest failed to add significant contribution to economic growth in Bangladesh.

In Bangladesh, private sector credit held the largest component of bank credit, accounting for 81.91 percent of total domestic credit in June 2015. The other components, namely Government and other public sector credit contributed 15.72 percent and 2.37 percent respectively of total credit in the banking system. Retaining the dominant position in total bank credit, private sector credit is further decomposed into some broad economic sectors shown in Table 1.

**Table 1: Sectorwise Distribution of Private Sector Credit**

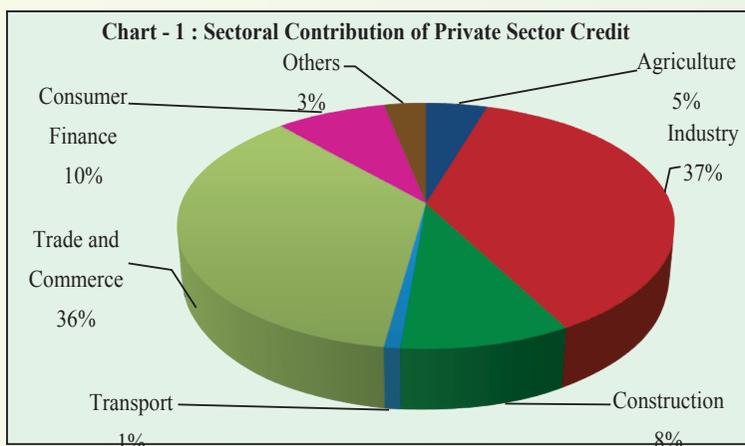
(In percent)

| Sectors/Years      | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 | FY2015 |
|--------------------|--------|--------|--------|--------|--------|--------|
| Agriculture        | 5.72   | 5.63   | 4.91   | 4.90   | 4.78   | 4.66   |
| Industry           | 35.56  | 35.85  | 34.01  | 34.67  | 35.57  | 36.73  |
| Construction       | 7.37   | 7.86   | 8.56   | 9.36   | 8.82   | 8.37   |
| Transport          | 1.40   | 1.61   | 2.10   | 2.18   | 1.15   | 0.77   |
| Trade and Commerce | 37.30  | 37.61  | 37.59  | 36.88  | 38.95  | 36.07  |
| Consumer Finance   | 0.00   | 0.00   | 0.00   | 0.00   | 6.23   | 9.93   |
| Others             | 12.65  | 11.44  | 12.83  | 12.01  | 4.50   | 3.47   |
| Total              | 100    | 100    | 100    | 100    | 100    | 100    |

**Source:** Statistics Department, Bangladesh Bank

Generally it is believed that credit to the productive sectors accelerates economic growth whereas that to the unproductive sector i.e. consumption cannot contribute to GDP significantly. Therefore Bangladesh Bank encourages banks to provide loans to the productive sectors while formulating monetary policy and issues various guidelines and directives as and when necessary. It is found from Table 1 that the percentage shares of agriculture, transport and trade and commerce in total loans declined during FY2010 to FY2015 whereas those of industry and construction improved.

The private sector credit provided by commercial banks at the end of June 2015, it is found that the percentage share of loans to the industry remaining the highest 37 percent followed by trade and commerce 36 percent, consumer finance 10 percent and construction 8 percent, agricultural sector 5 percent, transportation 1 percent and others 3 percent (Chart-1).



In Bangladesh, though agricultural and industrial sector held 16.0 and 30.4 percent shares of GDP respectively, shares of total private sector credit by banks were 5 and 37 percent respectively at the end of FY2015. Similarly, shares of GDP in trade and commerce, and transportation were 14.1 and 11.4 percent of GDP respectively whereas their shares of total private sector credit stood at 36 and 9 percent respectively.

The historical data show that percentage share of bank's credit to private sector to nominal GDP, has increased steadily from FY1980 to FY2015. However percentage shares of bank's credit to private sector to nominal GDP declined to 37.96 percent in FY2015 from 38.66 percent in FY2015. This trend indicates that Bangladesh maintained a moderate rate of economic growth instead of declining trend in private sector credit to GDP in recent years.

Table 2 shows the growth rate in the different sectors of GDP. It is found that growths in the agriculture and transport sectors maintained decreasing trends. The growth rates in the agricultural and transport sector were 3.00 percent and 6.00 percent respectively in FY2015 while those were 6.20 percent and 7.60 percent respectively in FY2010. Growth rate in Industry sector achieved the highest and continued to increase. The growth rate in the industrial sector was 7.00 percent in FY2015 while that was 9.60 percent in FY2010.

**Table 2: Percentage Change in Sectoral GDP**

(In percent)

| Sectors/Years      | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 | FY2015 |
|--------------------|--------|--------|--------|--------|--------|--------|
| Agriculture        | 6.20   | 4.50   | 3.00   | 2.50   | 4.40   | 3.00   |
| Industry           | 7.00   | 9.00   | 9.40   | 9.60   | 8.20   | 9.60   |
| Construction       | 7.20   | 7.00   | 8.40   | 8.00   | 8.10   | 8.60   |
| Transport          | 7.60   | 8.40   | 9.20   | 6.30   | 6.10   | 6.00   |
| Trade and Commerce | 5.90   | 6.70   | 6.70   | 6.20   | 6.70   | 6.60   |
| Others             | 6.30   | 10.40  | 14.80  | 9.10   | 7.30   | 8.80   |

Source: Bangladesh Bank

In Bangladesh, economic growth rate is higher compared to some other developing countries. GDP growth rate is 6.5 percent in 2015 and average GDP growth rate recorded at 6.21 percent during the last ten years. One of its main reasons was higher private sector credit growth which recorded at 24.2 percent in 2010. Though it decreased to 13.2 percent in FY2015 (Chart-2), it may be considered as high credit growth.

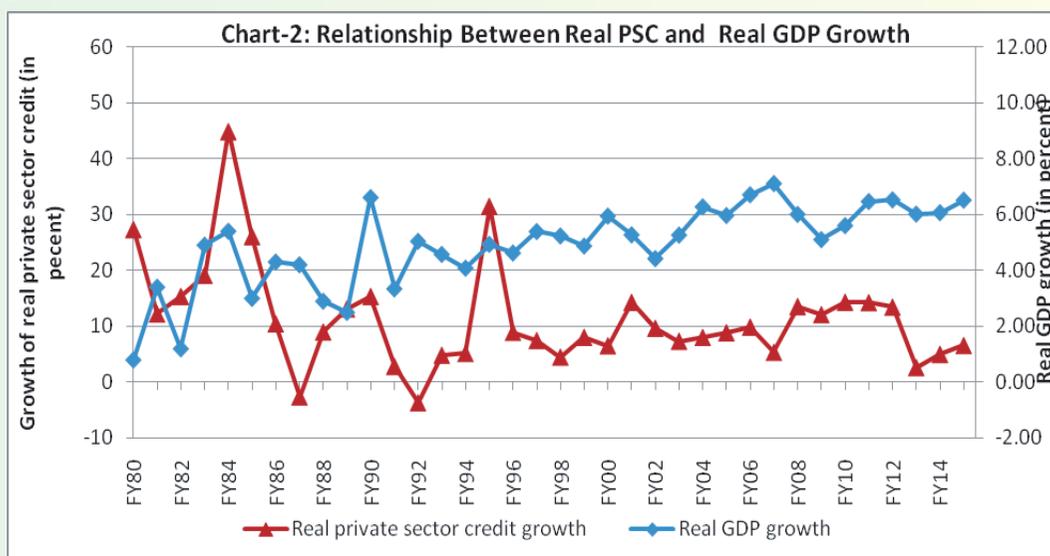


Chart- 2 shows that relationship between real private sector credit and real GDP growth from FY1980 to FY2015. The relationship between the two growth variables appears to be positive but not very strong the entire sample period due mainly to fluctuation in growth of real private sector credit and real GDP during FY1980 to FY2000. But after FY2000 onwards there is a comparatively strong co-movement of these two growth variables in the same direction indicating that a positive relationship between them.

#### 4. Data and Methodology

This study considers finding out the relationship between two variables- Bangladesh's real GDP and real private sector credit. It uses annual data for the period from FY1980 to FY2015. We use private sector credit data in nominal term from Bangladesh Bank and deflate them by consumer price index (CPI). On the other hand, the source of real GDP is Bangladesh Bureau of Statistics (BBS).

All the variables are taken in log linear form. While choosing an appropriate regression model, it is often very useful to see nature of data i.e whether there is a unit root. There are two most popular tests - Phillip Perron (PP) and augmented Dickey-Fuller (ADF) - for checking unit root. The ADF test adjusts Dickey-Fuller test to take care of possible serial correlation in the error terms by adding the lagged difference terms of the regressand while PP test use nonparametric statistical methods to take care of serial correlation in the error terms without adding the lagged difference terms (Gujrati, 2003). We perform both unit root tests for all variables. If unit root tests show that all variables have unit root at the levels but stationary at their first differences, then the variables are considered as cointegrated of order one i.e. I(1).

If the variables are characterised as cointegrated or I(1), there can be found a long run relationship among them by the cointegration analysis techniques. The core motivation behind the cointegration techniques is that if a linear combination of a set of non-stationary variables is stationary, those variables are said to be cointegrated or exhibited long run relationship. There are a lot of cointegration techniques, but to establish a long run relationship between real GDP and real private sector credit, we apply only Johansen (1988) and Johansen and Juselius (1990) cointegration analysis. While applying Johansen cointegration analysis, there are five options based on assumptions in the nature of data. Options 1 and 2 do not allow any deterministic trend in data- option 1 assumes no intercept and trend while option 2 allows intercept but no trend (option 2). Options 3 and 4 allow linear deterministic trend in data - option 3 assumes intercept but no trend while option 4 allows both intercept and trend (option 2). Between option 3 and 4 one may select option 4 only if the trend term is significant. Option 5 allows quadratic deterministic trend in data.

Johansen and Joan Juselius technique basically provides two test statistics - trace ( $\lambda_{\text{Trace}}$ ) and maximum eigenvalue ( $\lambda_{\text{Max}}$ ). Johansen and Juselius (1990) suggest that the maximum eigenvalue test gives better results. Enders (2010:392) asserts that when the results conflict, the maximum eigenvalue test is usually preferred for its ability to pin down the number of cointegrating vectors.

Since cointegration tests are sensitive to the lag length, we determine lag length through an unrestricted Vector Auto Regression. There are several criteria for selecting lag length. Among these the widely used techniques are the Akaike information criterion (AIC) and Schwartz information criterion (SC). We select lag length on the basis of AIC and SC.

In our two-variable case, the number of cointegrating equations must be less than two if data set of variables is cointegrated. Once the cointegrating relation is found, then we need to make a vector error correction model. It is performed in order to correct any deviation from the path of cointegration relationship and examine both the long and short run causality among cointegrated variables. The speed of correction of disequilibrium process is done by magnitude of error correction term.

## 5. Empirical Results and Findings

Table 1 in the appendix presents the results of unit root tests with data on Bangladesh's real GDP and real private sector credit. Both variables show unit roots in levels, but they become stationary in first differences. Therefore, the variables are cointegrated of order one i.e.  $I(1)$ .

Base on both Akaike and Schwartz information criteria (Table 2 in the appendix), we chose the minimum lag requirement for cointegration test is one lag. Regarding Johansen cointegration analysis we applied both Options 3 and 4 because the nature of our data shown in figure 1 in the appendix appears mostly deterministic trends.

From the results of cointegration tests shown in Table 3 in the appendix, we found that both the trace and maximum eigen value tests show one cointegrating equation in both options. Thus, real GDP and real private sector credit are cointegrated in Bangladesh. However, the trend term in the cointegrating equation in is highly significant (Table 4 in the appendix), which confirms us to accept results in favour of option 4 and results of the subsequent VEC model are shown in Table 5 in the appendix.

The cointegrating equation for VEC model has been normalized on GDP and shows a significant and positive long-run relationship between real private sector credit and real GDP. It is found that the coefficient of RPSC is 0.40 which is positive and significant which means that Private sector credit can alone explain 40 percent of variation of GDP in the long run in Bangladesh.

From the error correction results, we see the coefficient on the error-correction term on

real GDP equation is -0.05 which is significant and possesses opposite sign of the long run coefficient. It implies that any deviation from the long-run equilibrium is only corrected by real GDP. On the other hand, the coefficient on the error-correction term on real private sector equation is 0.16 which is significant, but not opposite sign of the long run coefficient. This reveals that any changes in real private sector credit causing disturbance in long-run equilibrium are corrected by counter-balancing changes in the real GDP.

The robustness of the ECM model has been passes by the three most important diagnostics is shown in Table 6 in the appendix- Jacque-Bera normality test, Residual Portmanteau Tests for Autocorrelations and white test for heteroscedasticity. All these tests revealed that the model provides consistent results. Moreover adjusted R2 (0.59) shows that the model is a modest goodness of fit. Therefore, the results can be accepted for interpretation.

## 6. Policy Recommendations

Applying cointegration and Vector Error Correction Models to examine long run and short run relationship between real private sector credit and real GDP, we found that there is a positive long run relationship based on the sample data and methodology. Private sector credit is able to explain 40 percent of variation of GDP in the long run in Bangladesh. This means that the rest of the variation of GDP in the long run comes from other determining factors of GDP like quantity of labours and their productivity, technology, innovation, productivity, infrastructure facilities, investment environment, etc. In this regard, we could not address on the impact of these factors on GDP. This is the limitation of this paper. However, in short run, real GDP adjusts toward the equilibrium path once the balance the long run is lost due to a shock in the system. The short run adjustment path of real private sector credit to maintain the long run relationship is somewhat opposite towards equilibrium. This means that in the short run, changes in real private sector credit cannot contribute positively to maintain the long run relationship with real GDP if there is a shock in the system. So, loans disbursed to private sector should be considered cautiously. Unnecessary or unproductive loans to private sector, should be identified because of their inactive role to output growth. Therefore, to boost economic growth of the country, private sector credit should be increased to productive sector i.e. agriculture or industry which are the main drivers for optimum economic growth in Bangladesh.

## Appendix

Table 1 : Unit Root Tests

| Variables                  | Phillips-Peron Test |                          | Augmented Dickey-Fuller Test |                          | Decision |
|----------------------------|---------------------|--------------------------|------------------------------|--------------------------|----------|
|                            | With intercept      | With intercept and trend | With intercept               | With intercept and trend |          |
| <b>In Levels</b>           |                     |                          |                              |                          |          |
| Log RGDP                   | 9.30 (1.00)         | -2.01 (0.58)             | 5.82 (1.00)                  | -1.25 (0.88)             | I(1)     |
| Log RPSC                   | -2.48 (0.13)        | -3.83 (0.03)             | -2.40 (0.14)                 | -2.93 (0.17)             | I(1)     |
| <b>In First Difference</b> |                     |                          |                              |                          |          |
| Log RGDP                   | -4.34 (0.00)        | -12.22 (0.00)            | -0.86 (0.79)                 | -7.29 (0.00)             | I(0)     |
| Log RPSC                   | -3.68(0.01)         | -4.56(0.00)              | -3.41(0.02)                  | -3.96 (0.02)             | I(0)     |

Note: Figures in the parenthesis are pvalues used to decide on unit roots at the 5% significance level.

Table 2: VAR Lag Order Selection Criteria

| Lag | LogL   | LR      | FPE      | AIC    | SC     | HQ     |
|-----|--------|---------|----------|--------|--------|--------|
| 0   | -23.68 | NA      | 0.013735 | 1.39   | 1.48   | 1.42   |
| 1   | 167.51 | 351.36* | 0.00*    | -8.73* | -8.47* | -8.64* |
| 2   | 169.00 | 2.59    | 0.00     | -8.59  | -8.16  | -8.44  |
| 3   | 172.83 | 6.21    | 0.00     | -8.59  | -7.98  | -8.37  |

\* indicates lag order selected by the criterion

LogL = log likelihood, LR = sequential modified LR test statistic (each test at 5% level), FPE = Final prediction error, AIC = Akaike information criterion, SC = Schwarz information criterion, HQ = Hannan-Quinn information criterion

Table 3 : Johansen cointegration tests with Bangladesh's Real GDP and Real private sector credit: FY1980-FY2015

| Null Hypotheses ( $H_0$ ) | Alternative Hypotheses ( $H_A$ ) | Option 3         |       |    | Option 4         |       |    |
|---------------------------|----------------------------------|------------------|-------|----|------------------|-------|----|
|                           |                                  | $\lambda_{stat}$ | CV    | CE | $\lambda_{stat}$ | CV    | CE |
| $\lambda_{trace}$ tests   |                                  |                  |       |    |                  |       |    |
| $r = 0$                   | $r > 0$                          | 27.59            | 15.49 | 1  | 32.64            | 25.87 | 1  |
| $r < 0$                   | $r > 1$                          | 3.82             | 3.84  | 0  | 8.05             | 12.52 | 0  |
| $\lambda_{max}$ tests     |                                  |                  |       |    |                  |       |    |
| $r = 0$                   | $r = 1$                          | 23.77            | 14.26 | 1  | 24.59            | 19.39 | 1  |
| $r = 1$                   | $r = 2$                          | 3.82             | 3.84  | 0  | 8.05             | 12.52 | 0  |

**Note:** The  $\lambda_{\text{trace}}$  and  $\lambda_{\text{max}}$  are calculated as per Johansen (1990). p-values are calculated as per MacKinnon et al. (1999). CV signifies critical values calculated for the 5 percent level of significance. CE stands for cointegrating equation.  $H_0$  and  $H_A$  denote the null and alternative hypotheses, respectively. The  $\lambda_{\text{trace}}$  and  $\lambda_{\text{max}}$  test statistics under both models are computed by allowing for liner deterministic trends in data.  $r$  stands for the rank of the matrix, which denotes the number of the CE between the variables.

**Table 4 : Normalized Co-integration Co-efficients for log Real GDP**

| Log RGDP(t-1) | Log RPSC (t-1)          | Trend           | Options |
|---------------|-------------------------|-----------------|---------|
| 1             | <b>-0.919</b> (-15.457) | -               | 3       |
| 1             | <b>-0.403</b> (-2.517)  | -0.034 (-2.149) | 4       |

**Note:** All values in parentheses against each coefficient are standard errors. Coefficients are bold when significant at the 5 percent level

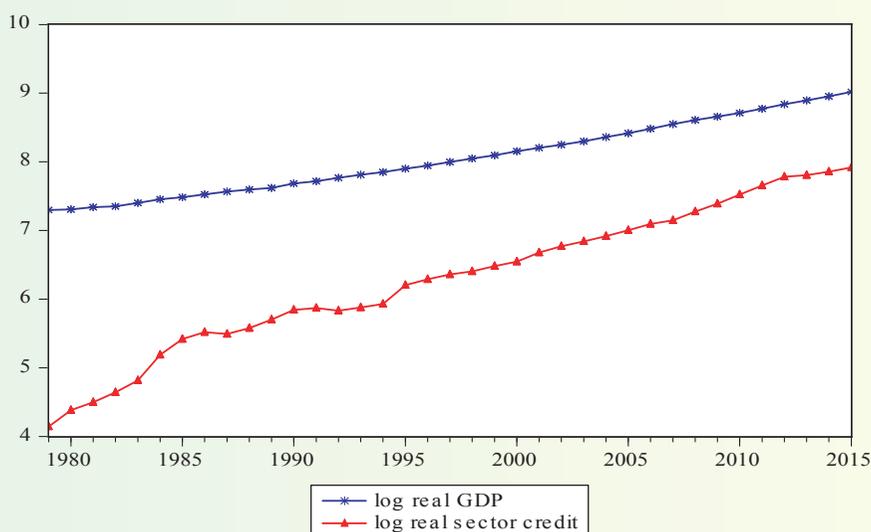
**Table 5 : Vector error correction estimates**

| Repressors                   | $\Delta\text{Log RGDP}(t)$ | $\Delta\text{Log RPSC}(t)$ |
|------------------------------|----------------------------|----------------------------|
| Constant                     | <b>0.058</b> (7.822)       | 0.009 (0.154)              |
| $\Delta\text{Log RGDP}(t-1)$ | -0.237 (-1.583)            | 1.478 (1.304)              |
| $\Delta\text{Log RPSC}(t-1)$ | 0.010(0.461)               | 0.245 (1.545)              |
| ect (t-1)                    | <b>-0.050</b> (-6.113)     | 0.160(2.568)               |
| Adjusted R <sup>2</sup>      | 0.59                       | 0.24                       |

Note: The error correction estimation follows option 4. Coefficients are bold when significant at the 5 percent level. All values in parentheses against each coefficient are standard errors. Coefficients are bold when significant at the 5 percent level. "?" stands for first-order difference operator. "ect" stands for error correction term.

**Table 6: Diagnostic tests**

| Test for   | Test Statistic | Probabilities | Conclusion                          |
|--|----------------|---------------|-------------------------------------|
| 1. Normality (JB test)                                 | 6.12           | 0.19          | Residuals are normally Distributed. |
| 2. VEC Residual Portmanteau Tests for Autocorrelations | 3.38           | 0.85          | No autocorrelation exists.          |
| 3. Heteroscedasticity                                  |                |               | No heteroskedasticity exists.       |
| White (cross terms)                                    | 24.45          | 0.61          |                                     |
| White (No cross terms)                                 | 19.10          | 0.39          |                                     |

**Figure 1 : Trends in log Real GDP and log real private sector credit**

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## Causality between Budget Deficit and Interest Rate: The Case of Bangladesh

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### *Abstract*

*The paper examines the dynamic linkage between the budget deficit and interest rate in Bangladesh over a long period of time (1974-2014) by applying standard techniques of time series analysis, i.e. cointegration, error correction models and Granger causality tests. It is evident that the data series are integrated of order one, i.e. they are non stationary at their levels and first difference makes them stationary. Then Johansen Juselius technique established that the considered variables are cointegrated, implying that there is a stable long run relationship between the two. However, to take care for the short run disequilibrating relationship, we have estimated the error correction model, which shows that the impact of budget deficit on interest rate is not instantaneous. The error correction model also shows bidirectional causality between the variables, which is also supported by the Granger causality test.*

**Key Words:** Budget deficit, interest rate, cointegration, error correction model.

**JEL Classification :** H60, H62

## 1.0 Introduction

The causal relationship between budget deficit and interest rate dates back to Mundel-Flemming model (1962, 1963) which assumes that an increase in budget deficit causes an increase in nominal interest rate with exchange rate appreciation and capital inflows. This has attracted much theoretical and empirical debate in the 1970s, in the backdrop of large and sustained increase of budget deficit in many developing and underdeveloped countries. It has been observed that to meet the growing public expenditure government of these countries borrowed severely from the domestic banking system that lead to the increase of the interest rate and thus crowds out private investment causing adverse impact on domestic output. However, during the 1980s, the Ricardian Equivalence as advocated by Rober Barro (1989) received much attention. This theory strongly advocates that there is no relationship between the budget deficits and the interest rate.

Due to this two diverging viewpoints about the relationship between the budget deficit and the interest rate empirically it becomes a combative and lively issue in the literature. Some of the early studies by Hoelscher (1983), Evans (1985), Darrat (1989), Findlay (1990) and Kormendi & Protopapadakis (2004) have found no significant relationship between the budget deficit and the interest rate. While the other studies by Makin (1983), Tanzi (1985), Cebula (1988), Zahid (1988), Vamvoukas (1997), Baer (2003) and Dai & Philippon (2004) have found a significant positive relationship between the budget deficit and the interest rate.

Bangladesh, a small open economy has been facing huge budget deficit over the years to meet it growing public expenditure. For Bangladesh public borrowings mostly based on domestic banking system. The interest rate on the loanable funds is also double digit. It is thus imperative to examine empirically the dynamic causal relationship between the budget deficit and the interest rate.

The study is based on the annual data from 1974 to 2014. In order to analyze short-run dynamics and long-run relationships among budget deficits and interest rate, the study make use of Vector Autoregression (VAR) and Vector Error Correction (VEC) specifications. As unrestricted VARs do not impose co-integration on its variables, a VEC model needs to be set up if the variables are known to be non-stationary and cointegrated. The study will use both the ADF and PP test to see whether the considered variables are stationary or not. Then the Johansen Juselius test will be applied to examine the cointegration of the variables. Finally error correction models and Granger causality tests will be applied to examine the short run dynamics of long run relationship between trade deficits and the interest rate.

The rest of the paper is organized as follows. Section 2 throws a birds eye view on the existing theoretical and empirical literatures. Analytical framework is presented section 3. Section 4 describes the estimation and interpretation of results. Finally section 5 concludes the study.

## 2.0 A Brief Review of the Literature

There is a diversity of theoretical and empirical literature on the relationship between the budget deficit and macroeconomic fundamentals for the developed countries. However, there is a scarcity of literature regarding developing countries like Bangladesh.

A very early study by U.S. Treasury Department (1984) show that deficits do *not* impact either short-term rates or long-term rates, i.e. deficits have at most a negligible effect on raising real interest rates (Treasury, 1984: p.82).

Leanne J. Ussher (1998) found that models which take account of multi-asset markets, investment accelerators and consider the alternative causality - interest rates to budget deficits. And also suggests that such models provide a richer understanding to the interaction between deficits and interest rates in their institutional setting.

Gale and Orsza (2004) provided new evidence that sustained budget deficits reduce national saving and raise interest rates by economically and statistically significant quantities.

Mukhtar and Zakaria (2008) showed that budget deficits do not have significant effect on nominal interest rates. These result reveals that the existence of the Ricardian deficit neutrality in Pakistan.

Bayat, Kayhan, and Senturk (2012) demonstrated that there is no causal relation between budget deficits, budget deficit ratio to gross domestic product and nominal interest rate in the Turkish economy during years between 2006 and 2011. Results reveal the existence of Ricardian equivalence hypothesis.

Obi and Nurudeen (2008) conducted an empirical test on the effects of fiscal deficits and government debt on interest rate in Nigeria. The objective of the study was to investigate the effect of fiscal deficits and government debt on interest in Nigeria. They employed Vector Auto-regression approach (VAR). Their empirical conducted focused on interest rate as being captured by the lending rate earlier specified by Bhalla(1995) and Deepak Lal et al. (2002) and the major findings of their study show that the explanatory variables account for approximately 73.6 percent variation in interest rate in Nigeria. The estimation also shows that fiscal deficits and government debt (our variable of interest) are statistically and economically significant.

It is evident that the results of the early studies are inconclusive. For Bangladesh no such studies have conducted to examine the dynamic causal relationship between the budget deficit and the interest rate. The study applies standard times series techniques of cointegration and error correction models to examine the relationship between the budget deficits and interest rate for Bangladesh considering a long span of data (1980-2014).

### 3.0 Analytical Framework<sup>1</sup>

#### 3.1 Data

This study is based on the annual data of 1974 to 2014 periods taken from the various issues of Bangladesh Economic Survey published by the Ministry of Finance. The paper considers the average lending rate by the commercial banks as the interest rate (R) and the difference between the government income and expenditure as the budget deficit (BD). Nominal values of both the figures are considered. The natural logarithmic scale BD has been used to view the percentage changes. The data has been processed and the results have been derived by using econometric software E-views.

#### 3.2 Granger Causality Test

The direction of causal relationship between two variables can be examined by the widely applicable Granger Causality test. According to this test in a two variable framework a variable X causes another variable Y if Y can be explained better by the current and lagged values of X than by the past values of Y alone assuming that both X and Y are stationary variables. Considering time series data in a two variables system the test is based on the following set of equations (Gujrati 2003):

$$Y_t = \alpha + \sum_{i=1}^m \beta_i Y_{t-i} + \sum_{j=1}^n \phi_j X_{t-j} + \varepsilon_t \dots\dots\dots(1)$$

$$X_t = \chi + \sum_{i=1}^m \phi_i X_{t-i} + \sum_{j=1}^n \mu_j Y_{t-j} + v_t \dots\dots\dots(2)$$

where,  $\varepsilon_t$  and  $v_t$  are white noise error term and assumed to be stationary, and m and n are the number of lags determined by Akaike's information criterion (AIC). Equation (1) shows that current Y depends on the past values of itself as well as that of X and equation (2) postulates a similar relationship for X. Given the above specification the statistical significance of the coefficients implies the causal relationship between the variables. It can be tested whether there is unidirectional causality from X to Y or Y to X. The statistical test can also establish feedback or bilateral causality or independence between the variables.

<sup>1</sup>This section draws on Hossain, M.A. (2015)

The test statistic applied to conduct the Granger test is usual F calculated as follows:

$$F = [(RSS_r - RSS_{ur})/m] / [RSS_{ur} / (n - k)]$$

which follows F distribution with m and (n - k) degrees of freedom (df). Here m is the number of lagged values of X included in equation (1) and k is the number of parameters estimated in the unrestricted equation. X is said to Granger causes Y if the computed F statistics is greater than the tabulated values at the specified degrees of freedom that is computed F is significant at the conventional level. The same procedure can be applied to test causality on the other way i.e. from Y to X (Gujrati: 2003).

### 3.3 Cointegration Test and Error Correction Models

The presence of cointegration between variables provides the basis for modeling both the short run and long run relationship simultaneously. If two variables  $Y_t$  and  $X_t$  are cointegrated, then according to Granger representation theorem (Engle and Granger, 1987) the relationship between them can be expressed as the error correction mechanism as follows:

$$\Delta Y_t = \lambda_1 Z_{t-1} + \sum_{i=1}^k \delta_i \Delta X_{t-i} + \sum_{j=1}^k \pi_j \Delta Y_{t-j} + u_{1t} \dots\dots\dots(3)$$

$$\Delta X_t = \lambda_2 Z_{t-1} + \sum_{i=1}^k \tau_i \Delta X_{t-i} + \sum_{j=1}^k \zeta_j \Delta Y_{t-j} + u_{2t} \dots\dots\dots(4)$$

where,  $Z_t = Y_t - \gamma X_t$ , and  $u_{1t}$  and  $u_{2t}$  are white noise error terms. In the above equations, the series  $Y_t$  and  $X_t$  are cointegrated when at least one of the coefficients  $\lambda_1$  or  $\lambda_2$  is not zero and thus calls for short run dynamics of the long run relationship between  $Y_t$  and  $X_t$ .  $X_t$  will lead  $Y_t$  in the long run if  $\lambda_1 \neq 0$  and  $\lambda_2 = 0$ . If  $\lambda_2 \neq 0$  and  $\lambda_1 = 0$  then  $Y_t$  will lead to  $X_t$ . However, the feedback relationship exists between  $Y_t$  and  $X_t$  if both  $\lambda_1 \neq 0$  and  $\lambda_2 \neq 0$ . Besides short run dynamics between  $Y_t$  and  $X_t$  are characterized by the coefficients  $\delta_i$ 's and  $\zeta_j$ 's. If  $\delta_i$ 's are not all zero, changes in  $X_t$  will lead to  $Y_t$  in the short run. If  $\zeta_j$ 's are not all zero, changes in  $Y_t$  will cause  $X_t$  in the short run (Woolridge: 2003).

### 3.4 Empirical Methodology

To apply the cointegration test and to estimate error correction models, we must first examine the time series properties of the investment and output variables by unit root tests. This is accomplished by applying augmented Dickey-Fuller (ADF) test, which is based on the following regression equation with a constant and a trend:

$$\Delta Y_t = a_1 + a_2 t + b Y_{t-1} + \sum_{i=1}^m \rho_i \Delta Y_{t-i} + v_t \dots\dots\dots(5)$$

where,  $\Delta Y_t = Y_t - Y_{t-1}$  and Y is the variable under consideration, m is the number of lags in the dependent variable, is chosen by Akaike information criterion and  $v_t$  is the

stochastic error term. The null hypothesis is that the coefficient of  $Y_{t-1}$  is zero. The rejection of null hypothesis establishes the stationarity of the series and no differencing is required to induce stationary. Otherwise differencing of the series is necessary to make them stationary.

The next step is to search for cointegration between variables. This can be done either by Engle-Granger two steps cointegration procedure or by Johansen-Juselius cointegration technique. We relied on Johansen-Juselius cointegration techniques because our sample size is small and by this we can avoid the defects of the Engle-Granger test. This test relied on the relationship between the rank of matrix and its characteristic roots. This test involves checking two test statistics to identify the number of cointegrating vectors. These are the trace statistic and the maximum eigenvalue test statistic. The Trace test statistic for the null hypothesis that there are at most  $r$  distinct cointegrating vectors is

$$\lambda_{trace} = T \sum_{i=r+1}^N \ln(1 - \lambda_i) \dots\dots\dots(6)$$

where,  $\lambda_i$ 's are the  $N-r$  smallest squared canonical correlations between  $X_{t-k}$  and  $\Delta X_t$  (where  $X_t = (BD_t R_t)'$  and where all variables in  $X_t$  are assumed  $I(1)$ ), corrected for the effects of the lagged differences of the  $X_t$  process.

The maximum eigenvalue statistic tests the null that the number of cointegrating vectors is  $r$  against the alternative of  $r + 1$  cointegrating vectors is given by

$$\lambda_{max} = -T \ln(1 - \lambda_{r+1}) \dots\dots\dots(7)$$

Johansen (1988) shows that equations (6) and (7) have non-standard distributions under the null hypothesis and provide approximate critical values generated by Monte Carlo methods.

The third step is the estimation of error correction model as specified in equation (3) and (4). Finally, standard F test has been used to examine the causality and feed back relationship between the time series.

**4. Discussion of the Results**

Based on the methodology discussed above, the budget deficit and interest rate series have been tested for the unit root suggested by ADF test and is further checked by PP test. The test is used to check whether the considered series are stationarity or not. Here we have applied the test to both the original series and to the first differences. In addition, both the models with and without trend are tested. The exact lag length, which is crucial in time series analysis, is determined by Akaike's information criterion. The results are reported in table -1.

**Table- 1: Unit Root Tests (ADF) for the period 1974-2014**

| Without Trend |                  |                   |
|---------------|------------------|-------------------|
| Variables     | Series in Levels | First Differences |
| LBD           | -2.03            | -4.57***          |
| R             | -2.02            | -6.70***          |
| With Trend    |                  |                   |
| Variables     | Series in Levels | First Differences |
| LBD           | -2.00            | -5.02**           |
| R             | -1.09            | -6.70**           |

Note: i)\*\*\* and \*\* indicates significance at 1% and 5% respectively.

ii) The optimal lag length has been considered to be 4 according to the Akaike information criterion.

**Source:** Own calculations by using econometric software E-views.

The ADF test result indicates both the budget deficit and interest rate series non-stationary at their levels both in inclusion of trend or non inclusion of trend in the model. However, taking first difference makes them stationary implying that the variables LBD and R are integrated of order one, i.e. I(1). The integration of order one of the variables indicate that is necessary to apply cointegration tests to determine whether there exist a stable long run relationship among them in Bangladesh. We applied the Johansen and Juselius approach to establish the cointegrating vectors. The result is presented in the following table-2.

**Table – 2: Johansen and Juselius Test of Cointegration**

| Data Vector | Lag | Hypothesis | $\lambda$ Trace | $\lambda$ Max |
|-------------|-----|------------|-----------------|---------------|
| LBD, R      | 1   | $r \leq 0$ | 16.08           | 15.42         |
|             |     | $r \leq 1$ | 1.05**          | 1.05**        |

Notes: i) we have experimented with a number of lags and found 4 to be the optimal lag length. The null hypothesis states that there doesn't exist at most  $r$  cointegrating relationship among the variables. ii) \*\* indicates significance at 5% level.

**Source:** Own calculations by using econometric software E-views.

Table-2, presents the maximum eigen-value and trace tests of Johansen and Juselius (1990). These are complementary versions of the same test to determine the cointegration

rank,  $r$ . Both the eigen value and trace statistic suggest that the budget deficit and interest rate are cointegrated in Bangladesh implying that the considered variables maintain a stable long run relationship meaning that budget deficit has long run impact on interest rate in Bangladesh. However, in the short run they may drift apart, i.e. they may be in disequilibrium. To take care of this disequilibrium, we need see the short run dynamics between the variables, which can be examined by error correction mechanism. The result is shown in table-3.

**Table – 3: Estimation of Error Correction Model**

| Independent Variable | Dependent Variable      |                         |
|----------------------|-------------------------|-------------------------|
|                      | D(LY)                   | D(LI)                   |
| Z <sub>t-1</sub>     | 0.204727<br>[ 3.47826]  | 0.253187<br>[ 2.55549]  |
| D(LY(-1))            | -0.299867<br>[-2.51603] | 0.316056<br>[ 1.57543]  |
| D(LY(-2))            | -0.501121<br>[-4.30434] | -0.053572<br>[-0.27337] |
| D(R(-1))             | 0.15771<br>[ 1.50455]   | -0.030571<br>[-0.17326] |
| D(R(-2))             | -0.151318<br>[-2.50040] | -0.080081<br>[-0.78613] |
| C                    | 0.224607                | 0.143938                |

Note: i) Figures in the Parenthesis represents  $t$  statistic.

Source: Own calculations by using econometric software E-views.

Table-3 reveals that the coefficient of the error correction term is statistically significant in the two equations implying that the changes in the budget deficit causally affect interest rate in the short run. It is also seen from the table that the coefficients in the lag terms are also positive and statistically significant. The implication is that the budget deficit has positive impact on the interest rate and the impact is not instantaneous. It implies that current budget deficit may have positive impact on future interest rate as well, which is very likely and is theoretically and empirically supported by both the

endogenous and exogenous growth models. It is also interesting to see that there is both way causal relationship between budget deficit and the interest rate. This result is also supported by the Granger causality test as shown in the following table-4.

**Table – 4: Direction of Causality (Granger Causality Test)**

| Null Hypothesis              | Obs | F-Statistic | Probability |
|------------------------------|-----|-------------|-------------|
| LBD does not Granger Cause R | 40  | 4.041 03*** | 0.00308     |
| R does not Granger Cause LBD |     | 9.30314**   | 0.00140     |

Note: \*\*\* and \*\* indicate significance at 1% and 5% respectively.

Source: Own calculations by using econometric software E-views.

## 5. Conclusion and Policy Implications

The paper examines the dynamic linkage between the budget deficit and interest rate in Bangladesh over a long period of time by applying standard techniques of time series analysis, i.e. cointegration, error correction models and Granger causality tests. It is evident that the data series are integrated of order one, i.e. they are non stationary at their levels and first difference makes them stationary. Then Johansen Juselius technique established that the considered variables are cointegrated, implying that there is a stable long run relationship between the two. However, to take care for the short run disequilibrating relationship, we have estimated the error correction model, which shows that the impact of budget deficit on interest rate is not instantaneous. The error correction model also shows bidirectional causality between the variables, which is also supported by the Granger causality test.

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## **Linking Waste Management with Banking Sector in Bangladesh: Status and Perception**

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### ***Abstract***

*Efficient waste management becomes a crucial issue for ensuring a sound environment and sustainable economic activities in Bangladesh. Throughout the entire business cycle, if waste can not treat properly in every stage, it may shrink a significant portion of the entire return. By ensuring proper waste management, it's possible to transform a large volume of waste into resources which results remarkable positive impact on environment, operating cost and business income besides ensuring employment. In this regard, banking sector among different stakeholders, may contribute a lot by implementing waste management techniques through its in-house practices and financing. The study reveals that, current status of banks in Bangladesh has received an appreciating attention in linking waste management till date and the bankers' perception in this regard needs to go far beyond to make the banking activities more acceptable and sustainable.*

**Key Words:** Environment, Sustainable, Waste, Likert scale, Reliability test.

**JEL Classification :** G21, Q53.

## 1. Introduction

Environmentally sound waste management becomes a burning issue for ensuring a sustainable environment and now-a-days it is drawing its logical impact on the overall economic activities. [Because throughout the entire business cycle, if waste is not treated properly in every stage it may eat up a significant portion of the entire return.] The public concern of the state of environment and waste management has been growing rapidly in the last few years but mainly at developed countries than developing countries like Bangladesh.

In Bangladesh, potentials and impacts of efficient waste management is massive, particularly in densely populated Dhaka city. On the way to increase the awareness at mass level in this regard, different initiatives are required to address the vital cause of the problem by attempting to change the current hazardous types of production, consumption and finally dispose of the wastage arising from the entire business chain. In offering a sustainable solution to all these patterns of economic activities, banking sector among many others, may contribute a lot through implementing diverse waste management techniques for itself and its customers.

While waste is not properly managed can causes serious health hazards or social problems in a community. It is of vital importance that waste should be managed in such a way that it does not cause any harm to either human health or to the environment. Waste management is not any longer a technological or logistics matter and the responsibility of the municipality alone rather, city residents and their behavior come increasingly into play. We need to convert the waste into energy to achieve our upcoming energy target but the entire process of managing waste to any form of resources like energy is a very costly endeavor.

Many factors play significant roles in waste generation, such as escalation urban population, economic advancement, changes in consumption pattern, adoption with changed climate, culture & institutional framework. Among these, Alamgir et al. (2005) considered urban population growth and economic development as vital factors as they not only accelerate consumption rates but also increase the generation of waste in developing countries. In Bangladesh, urbanization is occurring very rapidly and living standards are also improving at steady, particularly in Dhaka City. These transitions cause various positive impacts on overall economic development with some negative impacts also. One of those negative impacts is generation of huge volume of wastes, specially Municipal Solid Waste (MSW), which is causing severe environmental degradation.

According to Bhuiyan (1999), estimation of daily waste generation in the Dhaka City Corporation (DCC) is 3,500 tons, out of which 1,800 tons are collected and dumped at landfills, 400 tons are piled up on roadsides or open spaces, 400 tons are recycled, and the rest is illegally dumped on the way to dumpsite. The situation is much more alarming today in spite of taking a number of motivating initiatives like set-up of 'waste-bin' covering whole city.

Waste characterization studies have been carried out mostly at the disposal points, rather than at the source of waste before any recycling activities occur. In 2005, Japan International Cooperation Agency (JICA) characterizes the MSW on the basis of moisture content in MSW. It ranges from 65% to 80% for the mixed waste. Higher moisture content indicates the possibility of the development of anaerobic conditions in the disposal site that causes obnoxious odors and quicker rotting. Since the organic fraction in the waste stream is higher in quantity, composting has the more potential possibility as a waste management option (Yousuf and Rahman, 2007).

In Bangladesh, 'waste management' as part of environment friendly banking practices received a petty attention till date. Though recently, a limited number of banks have some inspiring initiatives for their in-house waste management and financing that includes recycling and reuse of used paper and equipment, financing projects to produce organic fertilizer from fruits and vegetables wastes, poultry slurry, and treatment of industry produced chemical waste, etc. Feeling responsible in this regard, Hage et al. (2009) suggested in his study that waste management should be given the highest attention in policies, programs or projects seeking behavioral change.

### ***Objectives of the Study:***

On the above background, the broad objective of the study is to examine the status and perception of banks regarding waste management as part of environmental friendly banking activities in Bangladesh. Specific objectives are: ***one***, to discuss a conceptual background of waste management; ***two***, to evaluate the existing policy and regulatory environment for developing sound waste management by Bangladesh Bank; ***three***, to examine the current status of in-house initiatives & financing and perception of banks in Bangladesh regarding waste management; and ***finally***, to put forward some recommendations for speeding up the effort of ensuring sustainable and clean environment in the country in line with the survey findings and perception analysis.

### ***Methodology:***

The study is based on both primary and secondary information. As to the secondary data, published research articles in different journals and various publications of Bangladesh

Bank and Bangladesh Institute of Bank Management (BIBM) have been consulted for preparing the paper. Primary data have been collected through questionnaire survey from the officials of the relevant desks of 21 commercial banks<sup>1</sup>. Findings of the survey results have been presented through the descriptive analysis, tables and graphs. The test of reliability of the questionnaire is conducted by using Cronbach's Alpha. Respondents have given their perceptions regarding qualitative issues on waste management on a five-level Likert scale as "1" for "Strongly disagree", "2" for "Disagree", "3" for "Neutral", "4" for "Agree" and "5" for "Strongly agree". Some success and failure cases from both supply side and demand side is also incorporated to reflect the existing and potential role of banks in designing and implementing efficient waste management techniques and mainstreaming the issue into their broader environment friendly banking activities. In spite of all these efforts, one has to be careful in generalizing the findings of the study as the review and analysis has done on the basis of sample banks.

### ***Organization of the Paper:***

The paper is organized into eight sections. After covering introduction, objectives and methodology in section one, section two and three attempts to discuss some conceptual background and literature review of waste management. Section four discusses some cross-country experiences while section five highlighted some waste management techniques and their applicability in banking sector. Section six detailed out the rules and policy initiatives of Bangladesh Government and Bangladesh Bank (BB) addressing waste management. Status and perception of banks in response to waste management in Bangladesh is reflected in section seven covering some cases of bank financing, banks' in-house practices and survey findings. Recommendations are also discussed in the same section in line with survey findings and perception analysis. Finally, section eight ended up with concluding remarks.

## **2. Conceptual Background**

Waste incorporates all items that people no longer have any use for, which they either intend to get rid of or have already discarded. Moreover, wastes are such items which people are require to discard, for example-household rubbish, sewage sludge, wastes

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<sup>1</sup>Sonali Bank Limited, Agrani Bank Limited, Uttara Bank Limited, Janata Bank Limited, Southeast Bank Limited, Prime Bank Limited, BASIC Bank Limited, BRAC Bank Limited, Bank Asia Limited, Dutch Bangla Bank Limited, Premier Bank Limited, Mutual Trust Bank Limited, Trust Bank Limited, NRB Commercial Bank Limited, NRB Global Bank Limited, Islami Bank Bangladesh Limited, First Security Islami Bank Limited, Shahjalal Islami Bank Limited, Al Araf Islami Bank Limited, EXIM Bank Limited and Citi Bank NA.

from manufacturing activities, packaging items, discarded cars, old televisions, garden waste, old paint containers, etc. All our daily activities can give rise to a large variation in different wastes arising from different sources like Municipal Waste, (including Household and Commercial), Industrial waste (including manufacturing), Hazardous Waste, Construction and Demolition Waste, Mining Waste, Waste from Electrical and Electronic Equipment (WEEE), Biodegradable Municipal Waste, Packaging Waste, End-of-Life Vehicles (ELVs) & Tyres and Agricultural Waste<sup>2</sup>. According to Medina (2008), waste is a relative concept. What is waste for one could be a resource for another. What is valueless for some could be useful for others. The richer the person, the higher the quantity of waste he or she produces. Waste management is now the serious issue addressed by the world today. Particularly it is severe in third world countries. Vollebergh (1997) also mentioned in his study that Waste-to-Energy plants are a very expensive way to save on climate change emissions. The International Expert Meetings<sup>3</sup> also focused the need to promote social and economic development through improving efficiency and sustainability in the use of resources and production processes and reduce environmental degradation, pollution and waste in 2003 and 2005.

### 3. Literature Review

Feeling responsible for managing one's waste seems to be the vital factor determining one to participate in household waste segregation and keeping the city clean, and should be given the highest attention in policies, programs or projects seeking behavioral change in this direction (Hage et al. 2009). There are a number of options available for the treatment and management of waste including prevention, minimization, re-use, recycling, energy recovery and disposal. The integrated approach, addresses for the first time the role of waste producers, as the waste problem is seen through what Clapp (2002) calls a "consumption lens". Moreno-Canchez et al. (2006) found a beneficial role of the informal waste-recyclers and emphasized the importance of integrating or organizing them into the formal waste management scheme in order to reduce their vulnerability and improve their livelihoods, working conditions and efficiency in recycling.

The urgency in managing waste properly and commercially is severe in case of countries where a significant portion of society comprises with poor or socially disadvantaged

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<sup>2</sup><http://scp.eionet.europa.eu/themes/waste>

<sup>3</sup>First International Expert Meeting in Marrakech, June 2003; and the Second Expert Meeting in San Jose, September, 2005.

people by any ways, like Bangladesh. Sinha(1995) in his study on Dhaka City Corporation (DCC) opines that, the poor and socially disadvantaged people involved in extracting recyclable materials from waste from the streets, waste bins and dump sites total more than 87,000 in number. This informal sector accounts for almost 10% of total employed workforce and is responsible for removing 26% of total generated waste in the DCC area. Waste management also causes Bangladesh a lot of budget allocation. Dhaka City Corporation's expenditure on solid waste management is 52.87% more than its income. The per capital expenditure for Solid Waste Management (SWM) in Dhaka is very low (Tk. 53) compared to other asian cities such as Bombay Tk. 304.00, Manila Tk. 192.00 and Bangkok Tk. 84.00 (Enayetullah, 1994).

#### **4. Cross-Country Experiences on Waste Management:**

Different countries of the world are managing their waste applying diverse techniques. Some of which are really appreciable while contrast scenario has also observed in some cases. A number of cross-country experiences<sup>4</sup> covering both developed and developing countries have been observed in Box-1. Bangladesh is expected to experience some of the positive practices observed in these countries, like, enforcement of waste management legislation, development of proper policy and planning framework incorporating both public and private sector, appointment of dedicated waste manager in business organizations to maximize waste management participation for the reduction of waste as well as minimizing the relevant cost.

#### **Box 1: Cross-Country Experiences and Lessons to be Learned**

- *Malaysia*

Recycling of household waste depends on the level of awareness and understanding of recycling. Improved education and increasing the accessibility of recycling facilities were found to be the best means of promoting positive attitudes to recycling attitude, partly because they helped to remove barriers preventing households from recycling. One of the effective strategies initiated by the government of Malaysia was recycling bins in every residential area.

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<sup>4</sup>HANDBOOK: Waste Management in Developing Countries

● ***Nigeria***

The majority of the residents of the largest city Lagos in Nigeria, are poor and make a heavy demand on resources which at the same time, generate a large quantities of solid waste. Approximately 4 million tonnes of municipal solid waste is generated annually in the city, including approximately 0.5 million of untreated industrial waste. Efforts by the various waste management agencies set up by the state government to keep its streets and neighborhoods clean have achieved only minimal success. This is because more than half of these wastes are left uncollected from the streets and the various locations due to the inadequacy and inefficiency of the waste management system.

● ***China***

Low cost informal recycling is practicing to manage Electrical and Electronic equipment or E-waste in many developing countries like China. Current gaps in environmental management, high demand for second-hand electronic appliances and norm of selling E-waste to individual collectors encourage the growth of a strong informal recycling sector in China. But, this informal-waste recycling is not only associated with serious environmental and health impacts, but also the supply deficiency of formal recyclers and the safety problems of remanufactured electronic products.

● ***Australia***

Small to medium-sized enterprises in Australia face numerous barriers to recycling participation. Inadequate storage space, paucity of readily available information on recycling services and the lack of staff allocated to sort and recycle were identified as major barriers. Cardboard, paper and plastic waste were produced in large volumes with only a small percentage being recycled and these were identified as target areas for local government.

● ***Germany***

Berlin has operated like many large cities/river basins with a partly closed water cycle for hundreds of years through a combination of careful wastewater treatment and the benefits of the soil aquifer treatment through bank filtration to produce potable water from the aquifers.

**5. Waste Management Techniques and their Applicability in Banking Sector:**

It is now, high time to give attention to waste management involving all stakeholders like Government, central bank, NGOs, employees, customers, suppliers, media and

communities. Involvement of financial sector, specifically banking sector is keeping its mentionable footsteps in all economic and developmental activities addressing the environmental issue. In Box-2, techniques of different banks regarding waste management are illustrated in detailed manner.

### **Box-2: Waste Management (WM) Techniques by Banking Sector**

#### **● *World Bank Contribution in WM:***

Drawing on World Bank Group Trust Fund financing and expertise since 2001, the Palestinians were able to improve solid waste management and environmental conditions in 80 communities in Jenin Governorate, with a population of 200,000 people. They achieved this by establishing a new sanitary landfill, closing and rehabilitating 85 dumpsites, and improving waste collection services. Towards the end of the project, the new landfill was expanded to serve all five governorates that comprise the northern West Bank (population 600,000), providing for further cost saving and enhancing public-private partnerships<sup>5</sup>.

#### **● *WM and Recycling in Union Bank :***

Union Bank has been a leader in financing the waste and recycling industry and in 2007 created a niche lending group to work with the industry. Only a few banks are involved in the financing of clean, reusable material from recycled waste, such as plastic, glass, metals, electronics, used oil, green waste (garden organics), and organic waste such as agricultural manure and sewer sludge. The portfolio contains dozens of companies that collect, process, and recycle waste materials, helping to reduce the amount of waste sent to landfills and the contamination of landfills with oil, electronics, and other pollutants. At the end of 2009, the bank's waste and recycling niche lending group had 43 core industry relationships in California, Oregon, Washington, Hawaii, and Texas totaling \$791 million in credit commitments. The majority of it's loan commitments finance the required infrastructure to process the incoming streams of waste products to be recycled.<sup>6</sup>

#### **● *WM by Standard Bank Group***

The environmental management system enables Standard Bank Group to track and manage environment-related aspects of their operations such as energy, water,

<sup>5</sup> <http://web.worldbank.org>

<sup>6</sup> <https://sustainability.standardbank.com/our-approach/>

carbon emissions and waste management. One of the environmental efficiency targets set for Standard Bank South Africa using 2009 as a base year was increased paper recycle at 5% by 2011. Moreover, in 2007, it's contractor levies a charge for this removal service and a certificate is issued confirming that the contents have been disposed responsibly. In addition, it's waste management system recovers and sells recyclable or reusable waste, including used paper and, spent printer and photocopier toner cartridges.<sup>7</sup>

Habib et al. (2015) addressed 'Minimizing Environmental Degradation, Wastes and Pollutions' as one of the three basic principles of green growth strategies. Here, waste management is also considered under the functional areas of intervention for green growth of resource efficiency. So, as a key part of financial sector of Bangladesh, banks are logically expected to make praiseworthy contribution in managing wastes properly and commercially through their in-house and financing activities and be an active part of green and sustainable economic growth.

## **6. Rules and Policy Initiatives regarding Waste Management along with their Compliance Issues: Bangladesh Perspective**

Identifying, treating and managing waste in proper manner is must for Bangladesh to attain overall environment friendly initiatives taken by different stakeholders like Government, Bangladesh Bank, Banks & NBFIS, NGOs, etc. To achieve the environmentally efficient waste management, it is prerequisite to reduce waste generation through prevention, recycling & reuse, encouraging companies to adopt sustainable practices and promoting sustainable public procurement practices. But all these would require massive efforts by the regulatory arms of the government as well as the relevant private and non-government entities and this is largely applicable for developing country like Bangladesh.

### ***Rules and Policy Initiatives of Bangladesh Government Addressing Waste Management:***

Environment Conservation Act (ECA), 1995 was adopted to conserve and improve the environmental standards and The Environmental Conservation Rules (ECR), 1997 was circulated to broadly define management of toxic and hazardous substances and guidelines for disposal of waste from different categories of industries. The national 3R goal for waste management is achieve higher levels of waste reduction, reuse, and recycling and minimize

<sup>7</sup> [https://www.unionbank.com/global/about/environment/sustainable-banking\\_finance/agriculture.jsp](https://www.unionbank.com/global/about/environment/sustainable-banking_finance/agriculture.jsp)

waste disposal on open dumps, rivers, flood plains and landfills by 2015. Here, municipal solid waste, industrial waste, biomedical waste, institutional and commercial waste and agricultural waste are identified by the government as priority sectors. But in reality, while complying the regulatory initiatives it becomes tough to manage waste as suggested in concern policy documents due to some institutional weakness, bureaucracy, lack of public awareness and knowledge gap. Removal of hazardous medical waste from renowned public hospital locality like- Dhaka medical, shifting tannery from Hajaribag to Savar, etc. are the burning examples in this regards.

### ***Policy Initiatives of Bangladesh Bank Addressing Waste Management:***

Efficient management of waste requires an elaborate waste management infrastructure such as waste bins, construction cost of primary and secondary waste collection points, sanitary landfills, convoys of trucks for pooling of wastes, waste treatment and recycling facilities, etc. All these require huge level of financial supports and policy initiatives from Bangladesh Bank (BB). There are a number of initiatives taken by the BB aiming to accelerate the green banking or sustainable banking arena where waste management issue got attention but at a very limited scale.

In 2011, the Bangladesh Bank for the first time address the waste management issue in its Environmental Risk Management (ERM) Guidelines for Banks and Financial Institutions in Bangladesh mentioning the glitches of improper disposal of hazardous waste. Again, in February 27, 2011, BB issued detailed policy guidelines for green banking. The policy noted air pollution, water pollution and scarcity, encroachment of rivers, loss of open space, loss of biodiversity, deforestation and improper disposal of industrial medical and house-hold waste as the key areas of environmental degradation (BB, 2011). Later on, the issue was made mandatory for the newly scheduled 9 banks also in 2013.<sup>8</sup> BB also pay heed to solid waste management and hazardous industry waste in the same circular, when it asked the financial institution to consider the environment and climate change related risk while assessing the overall credit risk of the potential borrower. BB developed a refinancing scheme of BDT 200 crore to ensure financing in renewable energy and environment friendly sector and here it allowed financing in three forms of Effluent Treatment Plants (ETP)- Biological ETP, combination of Biological and Chemical ETP and Chemical ETP attempting to convert to the combination of Biological and Chemical ETP (BB, 2013b)<sup>9</sup>. In 2014, refinancing scheme for renewable energy and environment friendly sector issued by

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<sup>8</sup> Green Banking and Corporate Social Responsibility Department (GBCSRD) Circular Letter No- 05, September 11, 2013.

<sup>9</sup> Maximum credit limit under this refinancing scheme for the three types of ETP arrangements are 4 crore, 2crore and 1 crore respectively.

BB widen its arena for financing in waste management feeling its notable importance in environment. It covers 3 eligible products for getting financing facility under solid waste management and 2 are under liquid waste management with specific maximum allowable credit limit under the refinancing scheme (BB, 2014a). The facilities under this scheme were extended for Islamic shariah based banks also in the same year<sup>10</sup>.

Banks are under close monitoring and regulatory pressure in attaining the direct green financing annual target which ultimately helps to accelerate their financing in waste management (BB, 2014b)<sup>11</sup>. Very recently, efficient waste management gets priority in BB's 'Guidelines on Environmental and Social Risk Management (ESRM) for Banks and Financial Institutions' in 2015, though it is not finalized yet. As per BB (2015), maximum allowable credit limit for Central ETP under 'Liquids waste management' sector is 15 crore BDT<sup>12</sup>. Appreciating all the efforts of BB, it is expected to focus more on waste management under its green banking window through different expected and regulatory interventions.

## 7. Waste Management by Banks in Bangladesh: Status and Perception

In line with global development and response to the environmental degradation, banking sector in Bangladesh is supposed to play important roles as one of the key stake holders. Clapp (2002) argues that distancing, geographically as well as mentally between consumers and their waste, is a very important dimension when talking about the waste problem. So, linking the consequences of waste generated from any sort of business or production activities need to be addressed primarily with producer and subsequently with consumer. Banks are trying to put some footsteps in waste management though at a very limited scale. As part of financing under waste management, banks offer financing to bio-gas, bio-fertilizer, recycle or reprocessing projects<sup>13</sup>, etc. However, there are some inspiring initiatives of some banks for both in-house waste management and financing<sup>14</sup>. Though the overall initiatives till to date from BB is undoubtedly praiseworthy, while there is still a room for further attention and effective drive to make the financing sustainable from social, health and overall environmental context.

<sup>10</sup> GBCSRD Circular No- 06, October 12, 2014.

<sup>11</sup> The annual target for attaining direct green finance of total disbursed/invested loan amount for banks scheduled before 2013 is 5% whereas it is 3% for banks scheduled after 2013.

<sup>12</sup> Sustainable Finance Department (SFD) Circular Letter No- 03, November 13, 2015.

<sup>13</sup> IBBL financed BDT 4.50 million to a client of Kapasia Branch, Kapasia, Gazipur for plastics Reprocessing in 2015. About 50 ton plastic bottles are collected from whole Kapasia area for reprocessing. The client has 36 employees and yearly turnover of this project is about Tk. 4.50 to 5.00 crore.

<sup>14</sup> HSBC recycles used papers to make envelope for re-use, DBBL has financed a project that produces quality organic fertilizer from fruits and vegetables wastes.

### ***Cases on Financing in Waste Management by Banks in Bangladesh:***

Banks in Bangladesh are proving exemplary initiatives in waste management. Generally, the environmental and health problems related to waste affect to the highest extent those inhabitants who have the least resources and therefore, very little power to change their situation, as they do not affect policy-making (Forseyth, 2002). Banks can put their bold footsteps in those areas through their financing. Box-3 spotlighted some of those initiatives.

#### **Box-3: Cases on Financing in Waste Management by Banks in Bangladesh**

##### ***a) Challenges in Animal Waste Management through Bio-gas Financing***

Mr. Shafiq, a farmer of Jamalpur installed a bio-gas plant taking loan from the local branch of a private commercial bank under four cow model. Besides the environmental motive of getting rid of negative impact of animal waste he was looking for some economic benefits from producing gas, electricity and organic fertilizer as well. Everything was going right as long as the cows were fed well; sufficient slurry was produced to generate desired volume of biogas. But the problem started when the farmer could not collect and feed sufficient grass and straw because of huge flood in the area. The volume of gas produced was declining day by day but the farmer failed to get supportive response from the supplier. The problem intensified when two cows died of malnutrition and the farmer, being frightened, sold another cow. Subsequently, the plant became inactive and the farmer's investment in the plant was lost. Under this circumstance, the borrower failed to repay the loan.

##### ***b) Successful Conversion of Poultry Waste through Composite Bio-gas Plant:***

Mr. Kabir, resides at Gazipur, has established an ideal composite set up. The firm uses recycled plastic poultry cases; poultry wastes are used for bio gas generation for fuel and electricity; and other wastes are used for compost fertilizer. The firm uses manure of the poultry to produce biogas which is used for electricity generation and cooking for farm laborers. To build this eco-friendly poultry composite, Mr. Kabir was awarded the best Trophy in the year of 1998 from the Directorate of Youth Development. Mutual Trust Bank financed him a composite credit facility of BDT 106.00 lac in different forms. Total cost of the project is BDT 1200 lac in an area of 12 bigha land in Gazipur and the estimated cost of the bio-gas plant is BDT 9.00 lac where Mutual Trust Bank Limited (MTBL) financed BDT 6.00 lac under refinance scheme of Bangladesh Bank in 2011. The plant size is 8000 cubic feet (20 x 20x 20) having a capacity of generating 3000 cft biogas. The gas is currently used for

household cooking and generating electricity for the poultry firm and household purposes. According to the entrepreneur, this type of project is quite viable as it helps to generate gas, electricity and organic fertilizer which can be used both for personal as well as business purposes in a profitable manner.

***c) Organic Waste Management Projects Integrating Dhaka City Corporation and Local Composting Company***

Composting reduces the need for chemical fertilizers, eliminates no methane and has positive spill-over effects on health, as the use of good quality compost in food production improves nutrition (Coad, 2006). Feeling the importance of this technique, Dutch Bangla Bank Limited (DBBL) financed a waste management project namely WWR Bio Fertilizer Bangladesh Limited for BDT 40.00 million (approx.) in 2009. WWR Bio Fertilizer Bangladesh Limited is a private limited company engaged in manufacturing of compost. Their establishment of the composting plants in Dhaka is based upon a concession contract with the Dhaka City Corporation (DCC) in which the local company (WWR BIO) has been granted the right to collect organic waste from local street markets in Dhaka. The plant of the client is located at Bhulta, Rugganj, Narayangonj.

**Source:** Based on the information from Demand and Supply side.

***In-house Practices of Waste Management by Banks in Bangladesh:***

A number of scattered in-house and financing moves focusing waste management have been observed by banks in Bangladesh. Some of the key initiatives are illustrated in Box-4.

**Box-4: Some Scattered In-house Practices of WM by Banks in Bangladesh**

● ***Mutual Trust Bank Limited:***

Use of scrap or one side used papers for note pad has become usual practice in the workplace.

● ***Islami Bank Bangladesh Limited:***

The Bank emphasizes in waste minimization of its resources and centrally collects its e-wastes and other solid wastes from every operational unit and disposes centrally through auction. In 2015, the bank earned BDT 2.40 million from sale of its e-wastes.

● ***Trust Bank Limited:***

Use scrap paper for taking draft print and as note pads.

- Bank Asia Limited

- Both sides of papers are used and wasted papers are collected using bins after shredding
- Food wastes are collected by community cleaners on daily basis
- Toner, cartridges and newspapers disposed off through community cleaners

**Source:** Annual Reports

### *Analysis of the Survey Findings and Recommendations:*

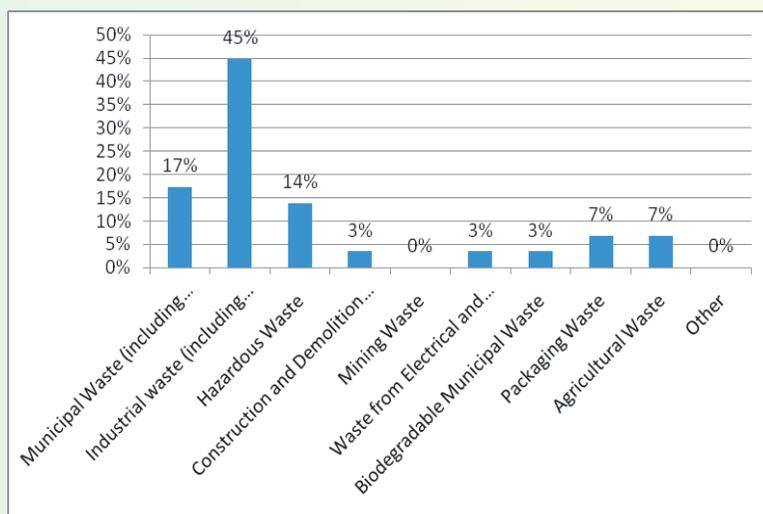
The survey data from the study reveals that from 2013 to 2015 total direct green finance in different products by banks in Bangladesh is getting its increasing trend (Table-1). Biogas, Bio-fertilizer and ETP are directly related to waste management among these products. Except Bio-fertilizer, other two products showing a growing tendency whereup to June, 2016 the trend is expected to follow the same pace at the end of the year. The total number of projects financed by banks upto June, 2016 are 3022, 5 and 396 respectively for Biogas, Bio-fertilizer and ETP. This trend is encouraging from waste management concern particularly in Biogas.

**Table-1 Direct Green Finance (BDT in '000')**

| Products                   | 2013   | 2014    | 2015    | June, 2016 |
|----------------------------|--------|---------|---------|------------|
| Biogas                     | 20053  | 13430   | 135931  | 173206     |
| Solar Home system          | 25393  | 31487   | 30896   | 17986      |
| Solar Panel Industry       | 0      | 0       | 500550  | 99730      |
| Solar -Irrigation          | 27250  | 20304   | 1575    | 20000      |
| ETP                        | 153498 | 322599  | 353591  | 391491     |
| Modern Bricks              | 310631 | 376409  | 333309  | 136920     |
| Bio-fertilizer             | 1700   | 3034    | 1054    | 510        |
| Others                     | 189087 | 298258  | 341480  | 274503     |
| Total Direct Green Finance | 727611 | 1065520 | 1698386 | 1114346    |

**Source:** Survey Data

To know in which type of wastes getting priority to banks for their financing, waste has been classified in ten categories- Municipal Waste (including Household and Commercial), Industrial waste (including manufacturing), Hazardous Waste, Construction and Demolition Waste, Mining Waste, Waste from Electrical and Electronic Equipment (WEEE), Biodegradable Municipal Waste, Packaging Waste, Agricultural Waste and Others.

**Figure 1: Type of Wastes Get Priority by Banks for Financing (in percentage)**

**Source:** Survey Data

The survey shows that, industrial waste (including manufacturing) got the highest priority (45%) where municipal waste (including household and commercial) took second position (17%). It is good to see that industrial waste receive most attention as it is responsible for a significant portion of water pollution specifically around Dhaka city (Figure-1).

**Table-2 Finance by Banks in Waste Management related Products (BDT in '000')**

| Products                                     | 2013     | 2014     | 2015     | June, 2016 |
|--|----------|----------|----------|------------|
| Biogas                                       | 150421   | 86810    | 137456   | 12936      |
| ETP  | 15603520 | 34410132 | 57797531 | 19794230   |
| Financing waste and hazardous disposal plant | 500000   | 2001770  | 346200   | 0          |
| Financing waste paper recycling plant        | 981380   | 394640   | 688664   | 1256779    |
| Financing waste battery recycling plant      | 197640   | 510460   | 542100   | 340400     |
| Clean water supply project                   | 4100     | 0        | 4120     | 12830      |
| Plastic waste recycling plant                | 0        | 0        | 41113    | 427193     |

**Source:** Survey Data

Table-3 depicts that except in 2015, banks concentrate their exposure more in rural area compared to urban area in terms of the number of clients for financing in waste management. The trend is identical for availing refinancing facility from BB except June, 2016. On the contrary, more financing is observed in urban area. It indicates that banks are concentrating more in urban area while doing financing with their own fund but in case of availing refinancing facility and covering clients, they gave more concentration on rural area. This demands logical synchronization.

**Table-3 Rural / Urban Green Finance and Refinance Facility (BDT in '000')**

|                                       | Rural |       |            | Urban   |         |            |
|---------------------------------------|-------|-------|------------|---------|---------|------------|
|                                       | 2014  | 2015  | June, 2016 | 2014    | 2015    | June, 2016 |
| Amount of Finance in Waste Management | 57686 | 14071 | 13067      | 4438120 | 3994643 | 7402223    |
| Number of Clients                     | 239   | 105   | 52         | 118     | 1163    | 44         |
| Amount of Refinance                   | 84018 | 13521 | 15960      | 51700   | 4700    | 17500      |

**Source:** Survey Data

Refinancing facility availed for Biogas enjoyed a swelling trend over the study period except June, 2016 (Table-4). From 2015 and onward banks started to avail the facility for ETP. But surprisingly only in FY 2015, banks availed the facility for Bio-fertilizer, where it is expected to continue the effort for agrarian country like Bangladesh to reduce the excessive use of chemical fertilizer.

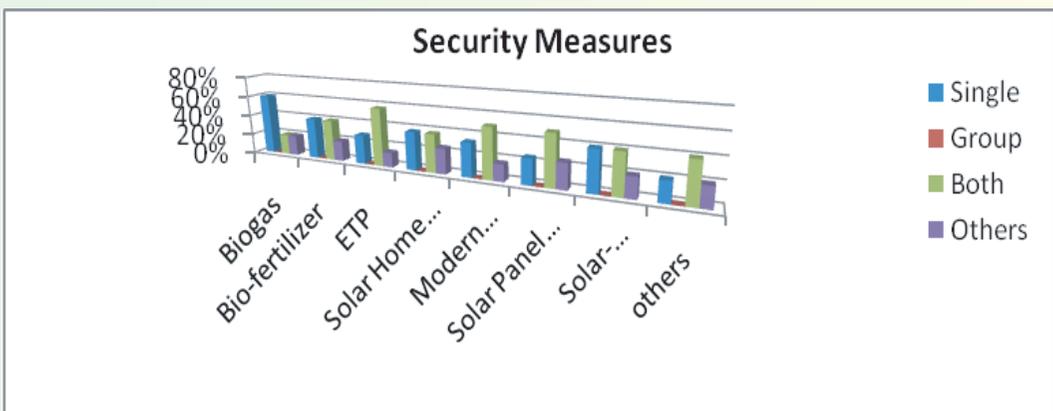
**Table-4 Product-wise Refinance availed from Bangladesh Bank**

| Products             | 2013   | 2014   | 2015   | June, 2016 |
|----------------------|--------|--------|--------|------------|
| Biogas               | 51444  | 67644  | 372069 | 8325       |
| ETP                  | 0      | 0      | 11561  | 19936      |
| Solar Home System    | 2247   | 47743  | 13578  | 0          |
| Modern Bricks        | 42250  | 22000  | 19120  | 5000       |
| Solar Panel Industry | 0      | 0      | 10000  | 0          |
| Bio- fertilizer      | 0      | 0      | 375    | 0          |
| Solar - Irrigation   | 27250  | 16650  | 0      | 0          |
| Others               | 0      | 480    | 56600  | 5025       |
| Total                | 123190 | 154517 | 483303 | 38286      |

**Source:** Survey Data

Security in case of providing credit facility is a core requirement for banks. But the justification and volume of it may vary from credit product to product based on the nature and objectives of the same. Security requirement may be relaxed for financing in waste management related products under green finance considering them from CSR commitment. Figure-2 states that, in case of Biogas 60% of security considered as single (borrower) security, for Bio-fertilizer both single (40%) and group security (40%) is taken equally and rest 20% is met up with other forms of security. However, in case of ETP both forms of security (single and group) got priority (57%).

**Figure 2: Security Measures for Waste Financing (%)**



**Source:** Survey Data

To ensure the efficient waste management in real sense, banks need to focus on the types of waste producing from the projects financed by them besides paying attention to profit making capacity. Proper mode of disposal for particular type of waste is equally important to safe the quality of our environment as a whole. The study reveals that highest percentage (30%) of waste took in the form of sludge from Effluent Treatment Plant (ETP) or Sewage Treatment Plant (STP) and this picture is mostly observed in Textile industry. So, banks need more caution in this regard from the very beginning of project appraisal. Municipal waste and Hazardous waste got second position (20%). Table-5 also demonstrates the 'Mode of Disposal' besides types of waste generated from different sources. 38% wastes are disposed through recycle (municipal and plastic wastes cover significant portion) whereas reuse and other forms of disposal techniques got the second priority in treating waste in environment friendly manner. Reuse is widely practices for paper waste and E-waste.

**Table-5: 'Types of Waste' and 'Mode of Disposal' (%)**

| Types of Waste              | %   | Mode of Disposal | %   |
|-----------------------------|-----|------------------|-----|
| Municipal Waste             | 20% | Recycle          | 38% |
| Hazardous waste             | 20% | Reuse            | 25% |
| Overburden or mine waste    | 5%  | Landfill         | 6%  |
| Construction waste          | 5%  | Incineration     | 6%  |
| Sludge from ETP or STP      | 30% | Others           | 25% |
| E - waste                   | 5%  |                  |     |
| Other non - hazardous waste | 15% |                  |     |

Source: Survey Data

### ***Perception Survey of Banks on Waste Management and Recommendations:***

Perception of sample banks on waste management has been verified through availability and authenticity of collected information. To link the waste management (WM) with banking sector of Bangladesh, some questions covering critical information like- benefit, challenges, difficulties, etc. were administered among different banks to know the bankers' perception. Respondents have given their perception on a five-level Likert scale as "1" for "Strongly disagree", "2" for "Disagree", "3" for "Neutral", "4" for "Agree" and "5" for "Strongly agree". The reliability test of the qualitative questions by using Cronbach's Alpha is also conducted in the study to know the inter-correlations among test items or questions incorporated in the questionnaire. <sup>15</sup>

Table- 6 presents a summary of banks' perception regarding benefits and difficulties of financing including refinance facilities from borrower's own source, banks or from BB for waste management. There are six statements regarding the issue and value of Cronbach's Alpha is 0.821. Test results illustrate that there is an internal consistency among the six statements which indicate that the set of items are from a single uni-dimensional construct.

The respondents were slightly more than neutral in case of opining on the benefits of availing refinance facility of BB for financing in WM related products. However, it is recommended that all the respondents will strongly agree regarding this refinance facility to make the initiative successful. Bankers are nearly agreed regarding the difficulties faced by them in getting refinance facility from BB and also the advantages of banks for

<sup>15</sup> Cronbach's Alpha increases as the inter-correlations among test items increase. Therefore, it is known as an internal consistency estimate of reliability of test scores.

financing in WM with their own fund. Difficulties of banks in financing WM with their own fund and advantages of clients from financing in WM are widely agreed by bankers as average scores are 4.19 and 4.14 respectively. However, it is a matter of worry that, all the respondents highly (4.38) agreed that clients are facing difficulties for financing in WM related products. The situation needs to be improved very quickly to ensure the successful implementation of environmental friendly initiatives taken by banks and BB.

To overcome these difficulties faced by clients, a number of initiatives can be recommended like- seek for expert opinion as WM related projects are little bit technical, arrange for training to develop more technically skilled man power in this area, ensure market readiness to accept the product/output of the WM projects with the help of Government support, etc. may be the mentionable ones.

**Table-6 : Summary of Benefits and Difficulties of getting Financing for Waste Management related Products**

| Particulars  | Minimum | Maximum | Mean/Average | Cronbach's Alpha if Item Deleted |
|--|---------|---------|--------------|----------------------------------|
| The Benefits of Availing Refinance Facility of Bangladesh Bank                       | 1       | 5       | 3.29         | .830                             |
| The Difficulties in Getting Refinance Facility from Bangladesh Bank                  | 2       | 5       | 3.62         | .750                             |
| The Advantages of Banks in Financing Waste Management with Bank's Own Fund           | 3       | 5       | 3.71         | .813                             |
| Difficulties of Banks in Financing Waste Management with Bank's Own Fund             | 3       | 5       | 4.19         | .759                             |
| Advantages of Clients from Financing in Waste from Bank's Perception                 | 3       | 5       | 4.14         | .785                             |
| The Difficulties of Clients for Financing in Waste Management from Bank's Perception | 3       | 5       | 4.38         | .813                             |
| Cronbach's Alpha   | .821    |         |              |                                  |

\* 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

Source: Survey Data

## 8. Concluding Remarks:

Bad waste management practices need to be replaced by good ones and it is widely applicable for developing countries like Bangladesh, where policy interventions from Government end alone cannot achieve the target of make the country clean and environment friendly. Contribution of other stakeholders including Bangladesh Bank, NGOs, banking sector, media, etc.can give a robust drive to accelerate the efficient waste management of the country as development partners. Of them, banks in Bangladesh are performing appreciating role in this regard, in spite of some challenges and limitations as the study reveals. Banks need to address the problems with effective and sustainable solutions, like- design specific credit product dedicated to waste management at industry level, introduce deposit scheme with comparatively higher return to depositors who are practicing healthy waste management in their business operations where banks can consider this extra cost of fund as CSR expenditure, positive as well negative incentives by BB for both business unit producing waste and lending institution can be introduced and alike. Banks of Bangladesh are now playing a praise worthy role in ensuring environment friendly country through their financial interventions and practicing conscious in-house waste management. In a nutshell, besides linking waste management with banking sector, a behavioral change in all stakeholders in the direction of attaining efficient waste management is a must to earn a sustainable and clean Bangladesh.

## Acknowledgements

The author is thankful to Bangladesh Bank for developing a detailed Green Banking Policy Framework and Environmental Risk Management Guideline in 2011 which addressed the waste management issue very vividly from financing point of view. The extensive survey and data collection from 21 commercial banks on linking waste management with banking sector in Bangladesh has helped the author to apprehend the current status of and banks' perception regarding waste management.

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## Real or Nominal Shock- What Drives the Exchange Rate Movements in Bangladesh?

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Ataur Rahaman\*

### *Abstract*

*This paper converses a primary element responsible for exchange rate movements of the US dollar against the Bangladeshi Taka. The dynamic effects of real and nominal shocks are scrutinized through conducting a structural vector autoregression (SVAR) model of real and nominal exchange rates with the assumption of the long-run neutrality restriction of nominal shocks on real exchange rate. In order to identify how these factors influence exchange rate variations, this approach allows us to decompose exchange rate movements into two components, real and nominal factors. This empirical analysis demonstrates the effect of a real shock on the real and nominal exchange rate is of a persistent nature, resulting in a long-run real appreciation and the effect of a nominal shock on the nominal exchange rate demonstrates that nominal shock takes around five months to maintain negative direction (depreciation) in the nominal exchange rate in Bangladesh.*

**Key Words:** Exchange Rates, Nominal Shocks, and Real Shocks.

**JEL Classification :** F31, O24, C32

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## I. Introduction

With the onset of flexible exchange rate regime since 31st May, 2003<sup>1</sup>, Bangladesh Bank, the central bank of Bangladesh, has liberalized the exchange rates<sup>2</sup> to achieve the goals of a vibrant market mechanism through the interaction of demand for and supply of currencies. Under this regime the international capital mobility has intensified the level of dollarization which in turn induces instability of exchange rate. Dollarization may reduce a 'fear of floating' by partially reducing the adverse impact of exchange rates fluctuations on the economy at the aggregate level. Viaene and Vries (1992) argued that, for the developing countries, exchange volatility has an adverse effect on international trade. Many emerging countries, on the other hand, appeared to be reluctant to allow exchange rates to move freely due to a 'fear of floating' psychology- as argued by Calvo and Reinhart (2002). There are several causes behind the emergence of such fear, as- the lack of credibility associated with the high volatility in exchange rates, high pass-through from exchange rates to domestic prices, and the sizable foreign currency dominated debt (Ok, Kakinaka, and Miyanamoto, 2010). Thus, exchange rates management has always been an important measure in mitigating external and internal imbalances as a nominal anchor in most of the developing countries, and Bangladesh is no exception.

The objective of this paper is to investigate the sources of movements in real and nominal exchange rates in Bangladesh. We assume that any shock to either type of exchange rates is due to the real shocks, such as resource endowments, technological advancement, preferences; and nominal shocks, such as money supply<sup>3</sup>. In order to identify the real and nominal exchange rates movements by the dynamic effects of real and nominal shocks, this paper conducts a structural vector autoregression (SVAR) model with the long-run neutrality restriction that is nominal shocks have only a short-run effect but no long-run effect on real exchange rates. Lastrapes (1992), Enders and Lee (1997), Chowdhury (2004), and Ok et al. (2010) conducted similar empirical studies which were based on the technique developed by Blanchard and Quah (1989).

The recent trend in emerging economies is that the exchange rates regime has been shifting toward nominal exchange rates flexibility, although often managed due to the 'fear of floating' (Calvo and Reinhart, 2002). Moreover, since the real exchange rates are typically considered as measures of international competitiveness, some emerging

<sup>1</sup>Exchange Rate Circular No. 01, Date: 29th May 2003, Bangladesh Bank.

<sup>2</sup>Exchange rate, in this paper, refers to the price of one unit of national currency in terms of foreign currency- US dollar. Following this definition a decline in the exchange rate would represent a depreciation, and vice-versa.

<sup>3</sup>Lastrapes (1992) and Evans and Lothian (1993) among others interpret temporary shocks as nominal disturbances and permanent shocks as real disturbances. Ha et al. (2007) regard real shocks as fundamental disturbances, and nominal shocks as non-fundamental disturbances.

countries seem to pursue the exchange rates policies that try to set the real exchange rates at some target level through adjusting the nominal exchange rates (Silva, 1999).

A number of studies incorporated structural VAR model with the long-run neutrality restriction of Blanchard and Quah (1989) in order to investigate sources of exchange rates movements by decomposing the exchange rates series into the real and nominal disturbances. Lastrapes (1992) for six developed countries (United States, Germany, United Kingdom, Japan, Italy and Canada) points out that real shocks dominate nominal shocks for both exchange rates series over short and long frequencies. Kim and Enders (1991) examine real and nominal causes of real exchange rates movements in the Pacific Rim nations and show some evidence of the long-run neutrality of nominal shocks. Clarida and Gali (1994), using data of four developed countries (Germany, Japan, Britain, and Canada) find that demand shocks, to national saving and investment, explain the majority of the variance in real exchange rates fluctuations; while supply shocks explain very little. Chen and Wu (1997) use the data for four Pacific Basin Countries (Japan, Korea, Taiwan and Philippines) and show that real shocks have a significant impact on the variability of real exchange rates and real shocks were more important during the 1990s than during the 1980s, especially for Japan, Taiwan and Philippines. Enders and Lee (1997) show that nominal shocks have a minor effect on the real and nominal exchange rates for Canada, Germany, and Japan over the sample period of January 1973 to April 1992. The work of Dibooglu and Kutun (2001), using monthly data from January 1990 through March 1999, demonstrates that nominal shocks are a dominant source in determining the real exchange rates movement in Poland, while real shocks are dominant in Hungary. Wang (2004) employs structural decomposition technique in his study and finds that relative real demand and supply shocks account for most of the variation in real exchange rates changes and supply shocks are as important as nominal shocks in accounting for real exchange rates fluctuations for China using yearly data from 1980 to 2002. Chowdhury's (2004) analysis for six emerging countries (Chile, Colombia, Malaysia, Singapore, South Korea and Uruguay) also show that real shocks dominate nominal shocks for the exchange rates series over the sample period of January 1980 to December 1996. Ha, Lee, and Cheong (2007) also find that exchange rates fluctuations are primarily a result of real shocks in Korea. Moreover, Ok et al. (2010) point out that real shocks in the direction of depreciation lead to real and nominal depreciation, while nominal shocks induce long-run nominal depreciation but real appreciation in short-run for Cambodia and Lao PDR.

To best of our knowledge, there is no study on Bangladesh that examines the sources of movements on real and nominal exchange rates using bivariate SVAR. This paper attempts to decompose real and nominal exchange rates fluctuations into real and

nominal factors through applying a SVAR model with the long-run neutrality restriction in which nominal shocks have only a short-run effect but no long-run effect on real exchange rates.

Our empirical finding from the SVAR analysis demonstrates that the effect of a real shock on the real and nominal exchange rates is of a persistent nature, resulting in a long-run real appreciation. This finding is consistent with, among others, Lastrapes (1992), Enders and Lee (1997), Chowdhury (2004), Ha et al. (2007), and Ok et al. (2010). On the other hand, the effect of a nominal shock on the nominal exchange rates demonstrates that nominal shock takes around five months to maintain negative direction (depreciation) in the nominal exchange rates in Bangladesh. This result is consistent with the argument of Dornbusch (1976) that raise in nominal money supply leads a proportionate rise (depreciation) in nominal exchange rates in the long-run.

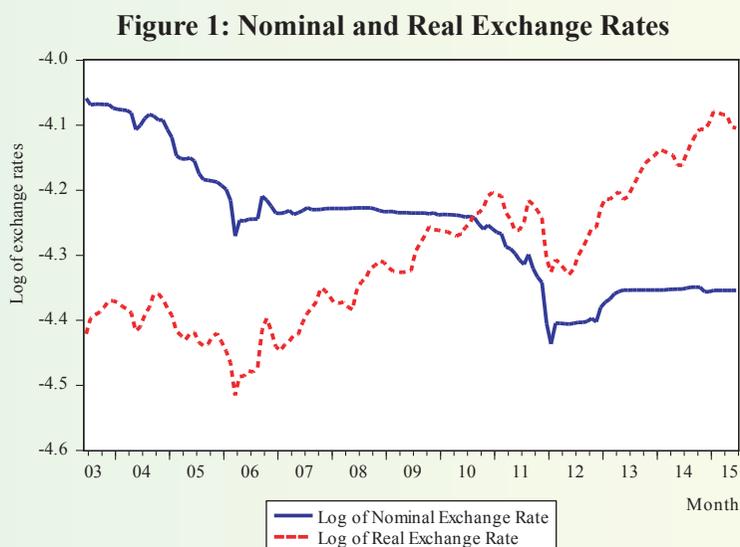
The remaining of this paper is organized as follows. Section 2 describes recent development of exchange rates, starting from the onset of flexible exchange rates regime, in Bangladesh. Section 3 conducts empirical analysis of exchange rates movements through decomposing the fluctuations of exchange rates into nominal and real components for the Bangladeshi Taka. The last section, Section 4, provides the conclusion along with several policy recommendations.

## **II. Exchange Rates Regime and Developments in Bangladesh- A Historical Overview**

The exchange rates system of Bangladesh witnessed different regimes. Primarily in January 1972, just after the liberation, Bangladesh pegged its exchange rates with the British Pound Sterling (Aziz, 2008). However, the sterling started to float against the dollar after the breakdown of the Bretton Woods system and then taka also started to float through its link to the sterling. Secondly, in August 1979, the monetary authority started to peg the exchange rates to a basket of major trading partners' currencies instead of pegging with a single currency. But the sterling still used as the intervening currency (Hossain and Alauddin, 2005). Since 1983, the monetary authority replaced the US Dollar as intervening currency instead of the Pound Sterling. From the independence to 1979, Bangladesh followed a fixed exchange rates system and between 1979 to mid-2003, it followed a managed floating exchange rates regime. The prime goal of these two regimes is to devaluation of the domestic currency, in order to maintain a stable real exchange rates and avoid overvaluation of domestic currency (Aziz, 2012). Finally, from 31 May, 2003 the country has officially introduced a kind of clean floating exchange rates policy by making it fully convertible on the current account, but the controls on capital account are still in place. Regime classification suggests that Bangladesh maintained a de facto managed floating regime by intervening in the foreign exchange

market on a regular basis. IMF also claimed that Bangladesh still maintained a de facto managed floating regime (Hossain and Ahmed, 2009).

Monthly nominal and real exchange rates of USD per Bangladeshi Taka from June 2003 to June 2015 is shown in Figure 1. From the beginning of June 2003 the nominal exchange rates were volatile and depreciating trend had been visible along with some fluctuations till December 2005. After that period, the economy observed the most volatility in the nominal exchange rates during the period of January 2006 to November 2006. Later that period, the nominal exchange rates remained nearly stable for a long period of time from July 2007 to August 2010. It started depreciating from September 2010 till January 2012, and the sharpest depreciation was observed in November 2011 resulting from high import demand and increase in fuel prices (BB Annual Report FY12). The economy again observed an almost stable nominal exchange rate till November 2012. Strong growth in the flow of inward remittances, increase in export earnings and sluggish import payments worked behind the sharp rise in nominal exchange rate during December 2012 to June 2013 (BB Annual Report FY13). Then it was stable up to June 2015 with a little bit of fluctuation.



Source: International Financial Statistics (IFS), IMF.

### III. Empirical Analysis

#### III.1. Model Specification

In order to specify our model, it has been assumed that observed real and nominal exchange rates are subject to two types of orthogonal shocks. The first shock is a "real

shock," which mainly comes from the fundamental disturbances related to various structural macroeconomic conditions including resource endowments, technological advancement, productivity, and preference. The terms of trade and international competitiveness are generally affected by the real shocks (Lastrapes, 1992; Enders and Lee, 1997; Chowdhury, 2004). The second shock is the nominal shock, which are mainly due to non-fundamental disturbances, such as nominal money supply shocks and the exchange rates depreciation or appreciation.

To provide some important perceptions on the sources of real and nominal exchange rates movements, we apply a bivariate SVAR analysis of real and nominal exchange rates through decomposing the variables into real and nominal shocks. Although the two shocks, real and nominal shocks, are not directly observable, they could be inferred from the examination of their joint behavior by imposing the long-run neutrality restriction that a nominal shock has no long-run or permanent impact on real exchange rates under certain assumptions (Enders, 1997; Wang, 2004). This restriction could be appropriate since the real exchange rates, as a relative price between domestic and foreign prices, is consistent with conventional economic models of exchange rates movements (Lastrapes, 1992).

The long-run neutrality restriction on SVAR models is applied for various issues, such as the identification of fundamental economic shocks (Blanchard and Quah, 1989; Shapiro and Watson, 1988; King, Plosser, Stock, and Watson, 1991; Lastrapes, 1992; Clarida and Gali, 1994; Wang, 2004; Chen and Wu, 1997; Chowdhury, 2004; Enders and Lee, 1997; Ok et al. 2010). This paper does not statistically test the neutrality restriction in the SVAR model. However, the restriction is simply required to make the structural disturbances just-identified and to examine the dynamic behaviors of these shocks on real and nominal exchange rates.

In order to identify the sequence of real and nominal shocks to exchange rates, we consider the infinite moving average representation in the structural shocks, following Lastrapes (1992), Enders and Lee (1997) and Ok et al. (2010), among others, as follows:

$$\begin{bmatrix} \Delta r_t \\ \Delta n_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} e_{rt} \\ e_{nt} \end{bmatrix} \quad (1)$$

where  $r_t$  and  $n_t$  are the natural log of real and nominal exchange rates in period  $t$ , respectively;  $e_{rt}$  the real shock in period  $t$ ;  $e_{nt}$  the nominal shock in period  $t$ ;  $\Delta$  the first difference operator;  $A_{ij}(L)$  a polynomial in the lag operator. By construction, we assume that the innovations are normalized with  $\text{var}(e_t) = I$ , that real and nominal exchange rates are non-stationary and non-cointegrated, and that the first-differences of real and nominal exchange rates are stationary.

To impose the long-run neutrality restriction that nominal shocks have only a short-run effect but no long-run effect on real exchange rates, we consider the restriction that the sum of the coefficients in  $A_{12}(L)$  is equal to zero, that is:

$$\sum_{k=0}^{\infty} \alpha_{12}(k) = 0 \quad (2)$$

where  $a_{12}(k)$  is the  $k$ -th coefficient in  $A_{12}(L)$  and represents the effect of the nominal shocks,  $e_{nt}$ , on the first-difference of the real exchange rates,  $\Delta r_t$ , after  $k$  periods. Thus, the restriction (2) simply implies that the cumulative effect of  $e_{nt}$  on  $\Delta r_t$  is zero, i.e., nominal shocks have no long-run effects on real exchange rates.

Some literature treats real and nominal shocks in a different, but related way under the assumption of the long-run money neutrality. For example, Chowdhury (2004) interprets the two types of shocks as permanent and temporary disturbances. The main feature of the permanent shock is that its effect on the time series lasts forever and thus never dies out, while the effect of temporary shock is of a transitory nature and dies out over time. Moreover, Ha et al. (2007) call the two types of shocks as fundamental and non-fundamental disturbances. The fundamental shock originates from structural macroeconomic conditions, resulting in permanent changes in real and nominal exchange rates. In contrast, the non-fundamental shock stems from monetary, non-fundamental factors, and has a permanent effect on nominal exchange rates but only a temporary effect on real exchange rates due to the long-run money neutrality.

Questions may arise as to whether this type of model is applicable to a developing economy such as Bangladesh. For example, the model assumes an open economy with a flexible exchange rates and capital mobility, and full employment in the long run. Bangladesh may not fully satisfy these assumptions. Fundamental changes in the economy over the past two decades have made the model increasingly more relevant. Bangladesh has opened up its trade and become more market oriented. The major progress in the trade policy reform started in 1991 with a substantial scaling down and rationalization of tariffs, removal of trade related quantitative restrictions and elimination of import licensing, unification of exchange rates and the move to a more flexible exchange rates system. In 1994, the Taka was made convertible for current account transactions (Ahmed and Sattar, 2004). And finally exchange rates became fully flexible in May 2003. Moreover, Chen and Wu (1997) mention some potential problems related to the interpretation of the two structural shocks as real and nominal shocks. First, nominal shocks could have permanent impacts on real exchange rates, as emphasized in the work of Baldwin (1988). Although we admit this issue, the SVAR model with the long-run neutrality restriction would be appropriate for our primary purpose, as long as

this impact is relatively small compared to that of real shocks, as shown in Blanchard and Quah (1989). Second, in reality exchange rates are subject to various types of shocks, so that the model with only two structural shocks may be inappropriate. However, since it is difficult to identify and test multiple shocks, the discussion under the assumption of the two structural shocks would be helpful to access the sources of exchange rates movements as an approximate methodology. Moreover, considering the two shocks is a well-known/celebrated means of generalizing the outcomes of other excluded, and plausible, shocks.

### III.2. Data and Preliminary Results

The data are taken from the International Monetary Fund's (IMF) International Financial Statistics (IFS). In order to carry out the empirical analysis, we use the monthly observations on bilateral exchange rates from June 2003, since the flexible exchange rate regime started from 31 May, 2003, to June 2015. Nominal exchange rates series considered is average-of-period rates and is expressed as US dollar per national currency units. The real exchange rate is derived by adjusting the nominal exchange rates with the ratio of the domestic price level to US price level. Consumer price index is used as a measure of price level in this case. The log-level real exchange rates series  $r_t$  is generally constructed as  $r_t = n_t - p_t^* + p_t$ , where  $n_t$  is the log of the nominal exchange rates considered from average-of-period rates,  $p_t$  and  $p_t^*$  are the log of the domestic price level and the log of US price level, respectively. Thus, the real exchange rates measure the relative price of Bangladeshi goods in terms of US goods.

The descriptive statistics of the differenced log of nominal and real exchange rates against the Bangladeshi Taka are represents in Table 1. The volatility of real exchange rates is greater than that of nominal exchange rates in Bangladesh. The average real appreciation rate is larger than the average nominal depreciation rate in Bangladesh. Table 2 shows the correlations among the first-difference log of nominal exchange rates, real exchange rates and domestic price level for Bangladesh. Nominal exchange rates are positively correlated and statistically significant with real exchange rates in terms of monthly returns. Moreover, statistically significant association can be found between inflation rate and real appreciation as well as inflation rate is also associated with nominal appreciation in Bangladesh.

### III.3. Estimation

In order to conduct the basic estimation of the SVAR model, there are several preliminaries needed to do. The first preliminary exercise is to investigate the presence of a unit root in the univariate representations of the real and nominal exchange rates. Augmented Dickey-Fuller (Dickey and Fuller, 1979) and Phillips-Perron (Phillips and

Perron, 1988) tests are carried out for all exchange rates series in log level and first difference. For all real and nominal log-level exchange rates the null hypothesis of the series having a unit root could not be rejected, which implies that the log-level of real and nominal exchange rates are non-stationary. On the other hand, the first-differences of real and nominal exchange rates are stationary in both tests (see Table 3). Since the real exchange rates series is non-stationary, it implies that purchasing power parity (PPP) appears to be violated in the log-run for Bangladesh within the given sample period. This result could be consistent with the argument that the long-run PPP does not hold for most emerging economics, although it is controversial whether the long-run PPP holds for developed economics (Gan, 1994; Taylor, 1995; Calvo and Reinhart 1995; Chowdhury, 2004; Ok et al. 2010).

Given the non-stationary results, we now test the long-run relationship between real and nominal exchange rates through examining whether the two non-stationary series are cointegrated for Bangladesh. The result of Johansen cointegration test (Johansen, 1992) suggests that for Bangladesh real and nominal exchange rates are not cointegrated. It implies that no long-run equilibrium between nominal and real exchange rates in Bangladesh over the considering period (see Table 4).

Given that real and nominal exchange rates are non-stationary at the level but stationary at the first-difference, and that they are not cointegrated, the SVAR specification can be appropriate to examine the dynamic effects of real and nominal shocks on real and nominal exchange rates.

### III.4. Impulse Response Functions

In order to investigate the effect of each type of shocks on real and nominal exchange rates, this paper estimates the SVAR model and derives impulse response functions (IRFs) for Bangladesh. The first panel of Figure 2 represents the dynamic response of real exchange rates to one standard deviation of real and nominal shocks, while the second panel of Figure 2 shows the dynamic response of nominal exchange rates to one standard deviation of real and nominal shocks over a horizon up to 72 months. Each panel is shown in terms of cumulative sums of the difference dynamics.

The first panel of figure 2 shows that one standard deviation of real shock induces an immediate accumulated positive response in the real exchange rates. This effect increases up to 12 months, after that the accumulated response of real exchange rates gradually declines and stabilizes in the long horizon. Thus, the effect of a real shock on the real exchange rates is of a persistent nature, resulting in a long-run real appreciation. Similar findings were derived by Lastrapes (1992), Enders and Lee (1997), Chowdhury (2004),

Ha et al. (2007), and Ok et al. (2010). On the other hand, one standard deviation of nominal shock persuades an immediate accumulated positive response in the real exchange rates. This response peaks at 2 months horizon and die out at 8 months horizon. It clearly reflects the identification restriction; the nominal shock has no effect on real exchange rates in the long-run. However, it does appear to be a non-trivial impact in the short-run.

The second panel of Figure 2 illustrates that one standard deviation of real shock tempts an instantaneous accumulated positive response in the nominal exchange rates. This effect peaks at 11 months, after these horizons the response of nominal exchange rates gradually declines and stabilizes in the long horizon. Thus, the effect of a real shock on the nominal exchange rates is of a persistent nature, resulting in a long-run nominal appreciation [similar findings were derived by Lastrapes (1992), Enders and Lee (1997), Chowdhury (2004), Ha et al. (2007), and Ok et al. (2010)]. The dynamic response of the nominal exchange rates to a real shock is very similar to that of the real rate. This suggests that permanent changes in the real exchange rates due to real shocks mainly occur through nominal exchange rates changes. On the other hand, one standard deviation of nominal shock persuades an immediate accumulated positive response in the nominal exchange rates. This response peaks at 2 months and dies out before 5 months horizon. After that it has negative response in the nominal exchange rates and below the zero-line for the rest of the forecasting horizons. Thus, nominal shock takes near about 5 months to maintain negative direction (depreciation) in the nominal exchange rates in Bangladesh. This result is consistent with the argument of Dornbusch (1976) that raise the idea that nominal money supply leads a proportionate rise (depreciation) in nominal exchange rates in the long-run.

If technology shock is considered as one type of real shock, which is of particular interest to the economy of Bangladesh, the impact of a real shock on real exchange rates can be discussed in the framework of Harrod-Balassa-Samuelson (Harrod, 1933; Balassa, 1964; Samuelson, 1964) argument- that the real exchange rates movements in the long-run could be explained by the productivity growth in tradable sectors. Higher productivity growth in tradable sectors tends to increase local input costs and therefore prices of non-tradable sectors (Berka, Devereux, and Engel, 2012). Since traded-goods prices tend to be equalized across countries, this raises the local price level, which is a real exchange rate appreciation (Berka et al., 2012). Thus, a positive technology shock should induce real appreciation of the home currency. This Harrod-Balassa-Samuelson effect has been found consistent with the case of Bangladesh. In addition, accelerated structural reforms and market liberalization, as observed in many emerging market economies since the late

1980s, are found to have led to a significant Harrod-Balassa-Samuelson effect (Ito et al. 1999; Agenor, 1998; Chinn, 2000).

Furthermore, the study has produced evidence that real shock dominates the nominal shocks in both exchange rates series for Bangladesh. Table 6 reports<sup>4</sup> that the magnitude of response of real exchange rates due to real shock (0.0176) has been found to be greater than the response of nominal exchange rates (0.0147). On the other hand, the magnitude of response of nominal exchange rate due to nominal shock is 0.0026 which implies that real shock dominates over nominal shock in the long-run (this findings also consistent with Lastrapes, 1992; Enders and Lee, 1997; Chowdhury, 2004; Ha et al. 2007; Chen and Wu, 1997; Ok et al. 2010).

### III.5. Variance Decompositions

In order to summarize the information contained in the moving average representation the variance decompositions (VDCs) are conducted in this paper and in which the exchange rates series can be decomposed into real and nominal shocks. The VDC measures the average, relative contribution to forecast error variance of each shock in terms of forecast horizon. On the other hand, impulse response function reveals the dynamics effect of a one-time shock. The VDC is a convenient measure of the relative importance of such shock into the system. The summarized results of the VDC for the first-difference of log real and nominal exchange rates for the periods up to 72 months are shown in then Table 7. Table 7 contains only the relative contribution of forecasted error variance in percent of the real shocks; the remaining variance is attributed to the nominal shocks for Bangladesh.

The relative contribution of a real shock in explaining the variation of real exchange rates is 68.88 percent at the horizon of one month, 64.87 percent at the horizon of four month, 61.03 percent at eight month and reaches at 53.75 percent at an increased forecasting horizon of 72 months. On the other hand, the relative contribution of a real shock explains about 99.78 percent of the variation of nominal exchange rates at the horizon of one month, 95.57 percent at four month, 92.42 percent at eight month, 91.47 percent at twelve month, and reaches at 89.04 percent increase in forecasting horizon of 72 months. It has clear evidence that real shock dominates nominal shock in both real and nominal exchange rates for Bangladesh. The relative contribution of a real shock in explaining the variation of nominal exchange rates is greater than that of real exchange rates, it might be

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<sup>4</sup> Table 6 represents Equation (1) mentioned in the model specification part. Table 6 has been derived from Table 5 which represents the long-run response patterns of the variables included into the Structural VAR model.

the case that real disturbances quickly capture most of the nominal exchange rates fluctuation in Bangladesh (this finding is consistent with the work of Lastrapes, 1992 for Japan).

In sum, real shock plays more important roles in explaining the variation of real and nominal exchange rates for Bangladesh. This result would be consistent with the high importance of real shock in most developed and emerging countries (Lastrapes, 1992; Enders and Lee, 1997; Chowdhury, 2004), but is in contrast to the high importance of nominal shock for Korea (Ha et al. 2007).

#### **IV. Conclusions**

The sources of exchange rates movements of real and nominal exchange rates in Bangladesh are investigated in this paper by conducting a structural VAR model over the sample period June 2003 to June 2015. It has been mentioned earlier that our paper assumes two structural shocks: real shock and nominal shock. Furthermore, we assume nominal shock has no long-run effect on real exchange rates. Based on these assumptions, we find that the effect of a real shock on the real and nominal exchange rates is of a persistent nature, resulting in a long-run real appreciation (consistent with among others Lastrapes, 1992; Enders and Lee, 1997; Chowdhury, 2004; Ha et al. 2007; Ok et al. 2010). On the other hand, the effect of a nominal shock on the nominal exchange rates demonstrates that nominal shock takes around five months to maintain negative direction (depreciation) in the nominal exchange rates in Bangladesh. This result is consistent with the argument of Dornbusch (1976) that raise in nominal money supply leads a proportionate rise (depreciation) in nominal exchange rates in the long-run.

A significant impact of real shock on exchange rates could provide some implications from a policy point of view. As Bangladesh now adopts the de facto managed floating exchange rate regime the objective of monetary and exchange rate policies should be to make an effort in offsetting the effect of real shock through sterilization of foreign reserve outflow or raise interest rate for the purpose of economic stabilization.

The model specification illustrated in this paper might be too simple since decomposition of the shock in only two types, nominal and real, might arise difficulties to capture any possible shock. Notwithstanding, the study believes that the findings of this paper highlight some important policy implications of the exchange rates movement in Bangladesh; and hopes that more in-depth research would be conducted in this area in the near future.

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**Table 1: Descriptive Statistics of Real and Nominal Exchange Rate**

|                    | $\Delta r$ | $\Delta n$ |
|--------------------|------------|------------|
| Average            | 0.0022     | -0.0021    |
| Standard Deviation | 0.0145     | 0.0106     |

**Note:**  $\Delta r$  is the first difference of logarithm of the real exchange rate and  $\Delta n$  is the first difference of logarithm of the nominal exchange rate.

**Table 2: Summary Statistic: Correlations Matrix**

|            | $\Delta r$      | $\Delta n$     | $\Delta p$ |
|------------|-----------------|----------------|------------|
| $\Delta r$ | 1               | -              | -          |
| $\Delta n$ | 0.76<br>(13.83) | 1              | -          |
| $\Delta p$ | 0.60<br>(8.97)  | 0.02<br>(0.28) | 1          |

**Note:**  $\Delta r$  is the first difference of logarithm of the real exchange rate,  $\Delta n$  is the first difference of logarithm of the nominal exchange rate,  $\Delta p$  is the first difference of logarithm of the consumer price index and numbers in parentheses are t-statistic.

**Table 3. Stationary Test**

| Variable | Level    |         | First -Difference |         |
|----------|----------|---------|-------------------|---------|
|          | ADF Test | PP Test | ADF Test          | PP Test |
| n        | -1.83    | -1.80   | -10.52*           | -10.52* |
| r        | -0.53    | -0.40   | -8.39*            | -7.97*  |

**Note:** n is the logarithm of the nominal exchange rate, and r is the logarithm of the real exchange rate. The lag length was selected basing on Schwarz's Bayesian Information Criterion (SBC). \* represents statistical significance at 1 percent.

(SBC). \* represents statistical significance at 1 percent

**Table 4. Johansen-Juselius cointegration Tests**

| $\lambda_{\text{trace}}$ test |                          |        |    | $\lambda_{\text{max}}$ test |                        |        |    |
|-------------------------------|--------------------------|--------|----|-----------------------------|------------------------|--------|----|
|                               | $\lambda_{\text{trace}}$ | Prob   | CE |                             | $\lambda_{\text{max}}$ | Prob   | CE |
| $H_0: r = 0^*$ $H_A: r > 0$   | 5.54                     | 0.7493 | 0  | $H_0: r = 0^*$ $H_A: r = 1$ | 5.33                   | 0.7001 | 0  |
| $H_0: r \leq 1$ $H_A: r > 1$  | 0.21                     | 0.6464 | 0  | $H_0: r = 1$ $H_A: r = 2$   | 0.21                   | 0.6464 | 0  |

**Note:** The  $\lambda_{\text{trace}}$  and  $\lambda_{\text{max}}$  are calculated as per Johansen (1988) and Johansen and Juselius (1990). p-values are calculated as per MacKinnon et al. (1999). r stands for the rank of the matrix, which denotes the number of the cointegrating equation between the variables. CE stands for cointegrating equation. \*Denotes rejection of the hypothesis at the 0.05 level.

**Table 5: Structural VAR Estimates**

Estimation method: method of scoring (analytic derivatives)

Convergence achieved after 6 iterations

Structural VAR is just -identified

Model:  $Ae = Bu$  where  $E[uu'] = I$

Restriction Type: long -run text form

Long -run response pattern:

|      |      |
|------|------|
| C(1) | 0    |
| C(2) | C(3) |

|                | Coefficient | Std. Error | z-Statistic | Prob.  |
|----------------|-------------|------------|-------------|--------|
| C(1)           | 0.017590    | 0.001087   | 16.18641    | 0.0000 |
| C(2)           | 0.014711    | 0.000937   | 15.69264    | 0.0000 |
| C(3)           | 0.002630    | 0.000162   | 16.18641    | 0.0000 |
| Log likelihood | 872.3870    |            |             |        |

Estimated A matrix:

|          |          |
|----------|----------|
| 1.000000 | 0.000000 |
| 0.000000 | 1.000000 |

Estimated B matrix:

|          |          |
|----------|----------|
| 0.010960 | 0.007366 |
| 0.010949 | 0.000511 |

**Table 6: Real and Nominal exchange rate equations**

|                                |                |                             |                               |
|--------------------------------|----------------|-----------------------------|-------------------------------|
| Real exchange rate equation    | $\Delta r_t =$ | 0.0176 $e_{rt}$<br>(0.0000) |                               |
| Nominal exchange rate equation | $\Delta n_t =$ | 0.0147 $e_{rt}$<br>(0.0000) | + 0.0026 $e_{nt}$<br>(0.0000) |

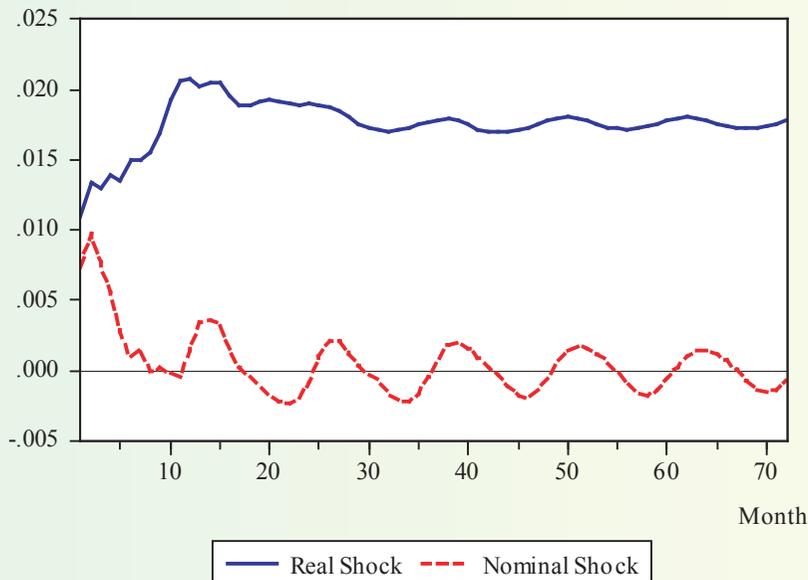
**Table 7: Variance Decompositions of Real and Nominal Exchange Rates**

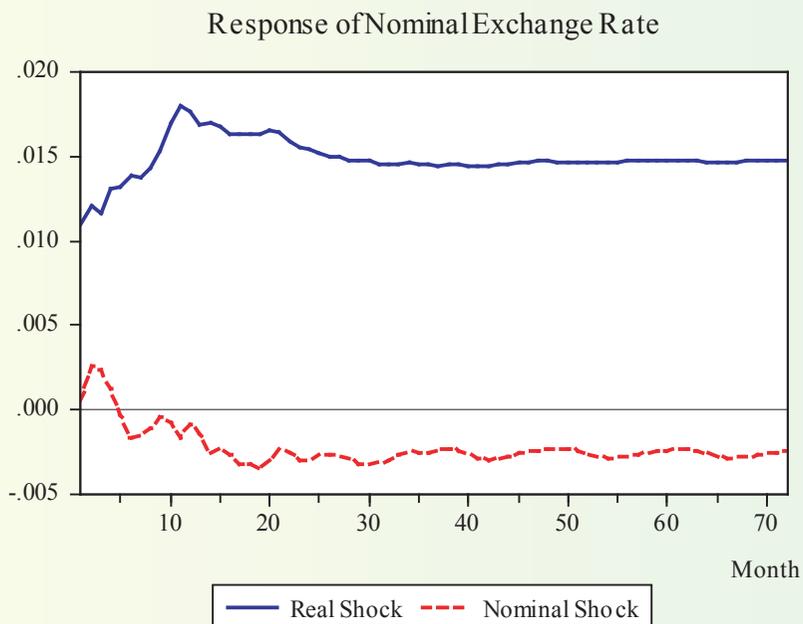
| Forecast Horizon | Relative Contribution of Real Shock to |            |
|------------------|--|------------|
|                  | $\Delta r$                             | $\Delta n$ |
| 1 -month         | 68.88                                  | 99.78      |
| 4 -month         | 64.87                                  | 95.57      |
| 8 -month         | 61.03                                  | 92.42      |
| 12 -month        | 61.70                                  | 91.47      |
| 24 -month        | 58.94                                  | 89.56      |
| 36 -month        | 56.77                                  | 89.31      |
| 48 -month        | 55.43                                  | 89.19      |
| 60 -month        | 54.47                                  | 89.10      |
| 72 -month        | 53.75                                  | 89.04      |

**Note:**  $\Delta r$  is the first difference of logarithm of the real exchange rate, and  $\Delta n$  is the first difference of logarithm of the nominal exchange rate. Contribution of a nominal shock is 100 minus the contribution of a real shock.

**Figure 2: Impulse Response Functions**

Response of Real Exchange Rate





## **Dynamics of Interest Rate Pass-through in Bangladesh An Econometric investigation for 2003 to 2015**

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### ***Abstract***

*This article empirically examines the dynamics of the interest rate pass-through mechanism for Bangladesh, by formulating and using an independent variable 'weighted average policy rate' (a combine rate constituted by using all policy rates of Bangladesh Bank - the central bank of Bangladesh) and lending rate, deposit rate and call money rate as dependent variables representing the lending, deposit and money market channels, respectively. We have used quarterly data for the period of 2003,Q1 -2015,Q4 published by Bangladesh Bank. The commonly used error correction and Engle-Granger (EG) models are used to examine the short-run and long-run pass-through respectively; a vector error correction (VECM) impulse response function (IRF) were employed to measure the short-run speed of the pass-through. Further, the Wald Test of Coefficient was used to measure the magnitude of the long run pass-through. We find that there is a symmetric, incomplete and very sluggish pass-through in Bangladesh for all lending, deposit and money market channels. We also found the greatest impact on the lending rate channel (40 percent) in short-run, while the adjustment speed is very slow in the all channels. In our understanding such paled profile of Interest Rate Pass-through in Bangladesh is due to non-reliance of Bangladesh Bank on interest rate tool for implementation of monetary policy.*

**Key Words:** Interest rate pass-through, cointegration, monetary Policy, Policy rates, Bangladesh.

**JEL Classification:** E43, G21.

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<sup>1</sup> This paper does not bear any opinion of Bangladesh Bank. All errors are authors' responsibility.

## Introduction

To the central banks across the world interest rate pass-through (IRPT) is one of the most relied channels of monetary policy. Theoretically it is assumed that policy rates have direct influence on both short term and long term money market rates which later, in turn, affect bank retail rates (i.e. both deposit and lending rates). IRPT, thus, is used as a package of economic stimulus in conventional monetary policy. After assessment of the trend of the business cycle and trend of price level of the economy, central bank usually sets its desired policy rates in open market operation (OPO) activities to keep the economy on track. Let us make a visit of the theoretical discourses of the interest rate and money supply and their implications on market and economy.

Now, the quantity theory of money postulates a direct and proportional relationship between money supply and price level. The traditional quantity theory of money as presented by Fisher's equation is as follows :

$$MV = PY \dots \dots \dots (1)$$

Where, the symbols have their usual connotations in economics. 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). Equation (1) can also be written as:

$$P = MV / Y \dots \dots \dots (2)$$

This equation (2) implies the proportionality between money and price. By taking natural log in both side of equation (2), it can be rewritten as

$$P^{\wedge} = M^{\wedge} + V^{\wedge} - Y^{\wedge} \dots \dots \dots (3)$$

Where  $\wedge$  indicates the growth rate of the relevant variables. Due to the full employment Output (Y) and by assumption velocity (V) in short run are fixed, so we can say that

$$P = f(M) \dots \dots \dots (4)$$

In other words,  $M \uparrow (\downarrow) \Rightarrow P \uparrow (\downarrow) \dots \dots \dots (5)$

This is how classical school establishes proportional relation between money supply and price level of an economy.

However, Keynesians criticized and rejected the proportionality between money and price. They argued that money has effects both on price and output level. According to them increasing money supply causes inflation but also reduce inflation. However, Keynes or his followers did not assume full employment. Therefore, there is a direct but not necessarily proportional relationship between money and price.

Again, some economist believe that through the competitive manner of money market, the policy rates are also expected to transmit into lending and deposit rates of the banking system which ultimately should bring desired changes in consumption and investment or aggregate demand of the economy. The process can be delineated as follows:

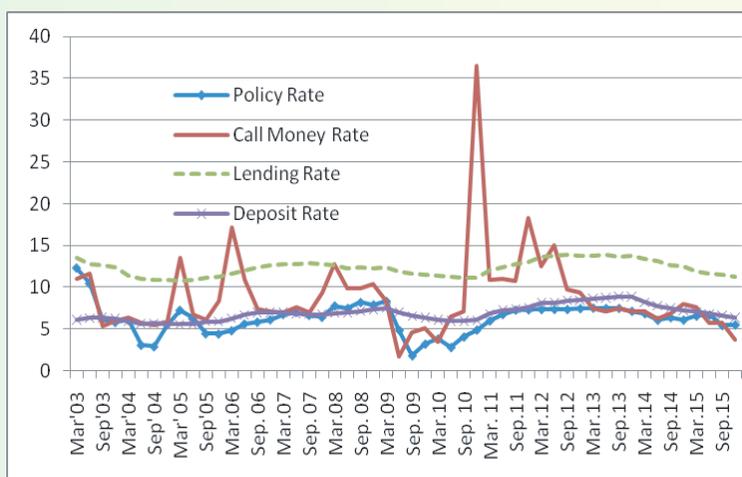
$$M\uparrow(\downarrow)\Rightarrow IR\downarrow(\uparrow)\Rightarrow I\uparrow(\downarrow)\Rightarrow Y\uparrow(\downarrow).$$

$$M\uparrow(\downarrow)\Rightarrow IR\downarrow(\uparrow)\Rightarrow S\downarrow(\uparrow)\Rightarrow C\uparrow(\downarrow)\Rightarrow Y\uparrow(\downarrow).$$

According to the transmission channel above, an expansionary monetary policy (M?) leads to a decrease in interest rate (IR?) which lower the cost of capital and increases investment (I?) or lower the earning of savings (S?) and increases Consumption (C?). This increase in investment and consumption will lead an increase in aggregate output (Y?) of the economy.

But, always there are some debates that whether empirical data supports this highly simplified theoretical assumption of IRPT. Monetary policy is considered to be effective if changes in the policy rates are completely passed through to retail interest rates over reasonably short period (Hoffmann and Mizen, 2004). However, empirical evidence in this regard is mixed. Accordingly, many empirical research based on data of different parts of the world have failed to substantiate that IRPT from policy rates to bank retail rates holds satisfactorily. Besides of contrasting conclusions of the some studies in the issue of the size and speed of the adjustment of IRPT some other studies show that pass through of policy rates to bank retail rates not only incomplete and sluggish but also asymmetric.

**Figure1:Co-movement of lending, deposit and market rates with policy rates in Bangladesh for 2003- 15.**



If the interest rate pass through to retail rates (i.e. deposit and lending rate) is incomplete, sluggish and asymmetric, then the use of monetary policy as a tool to control aggregate demand in the economy becomes a questionable action of the central bank. So, if the interest rate channel does not effective it cannot transmit monetary policy impulse to the real economy. A reduction in the nominal interest rate may be achieved by an expansion of the money supply, but it does not guarantee that the real interest rate will decline too (Taslim, 2014). It is, therefore, essential to know the degree, the speed and how symmetrically (or asymmetrically) retail interest rates are making response to a change in policy rates of the central bank.

### **Monetary Policy tools and approaches in Bangladesh**

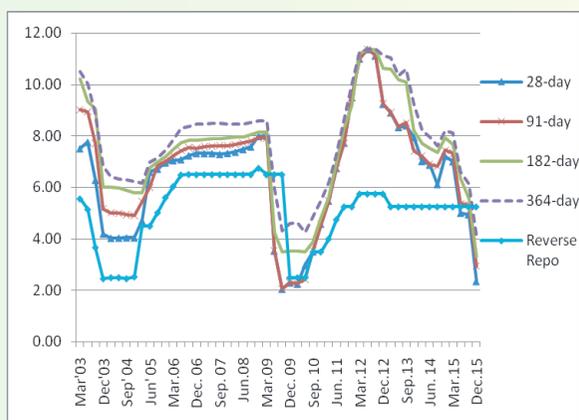
Monetary policy in Bangladesh, as outlined in Bangladesh Bank (BB) order 1972, is formulated around exchange rate and price level stability, and employment and output growth rates as the basic policy targets. To achieve these targets a rule based monetary aggregates such as reserve money, broad money and domestic credit (both private sector and government) are also projected, monitored and controlled to achieve desired targets.

In line with above law BB proclaims monetary programs for each financial year (July-June), accommodating monetary growth adequate for attaining the projected real GDP growth with inflation in the targeted range. Broad money (M2, currency in circulation plus time and demand deposits) growth path is the intermediate target in the program, with Reserve Money (RM, currency in circulation and balances of scheduled banks with BB) growth path as operating target of BB. The program also tracks the growth paths of several other aggregates/sub aggregates on the asset and liability side (domestic and foreign assets, credit to public and private sectors, currency in circulation, demand and time deposits and so forth), to help assess the growth supportiveness and likely inflationary impact of monetary expansion. Reverse repo, special repo, liquidity support and repo interest rates are BB's day to day instruments influencing the growth path of reserve money, ultimately to influence inflation via growth path of broad money. Besides, BB uses different tenure Bangladesh Bank Bills and Treasury Bills rates to keep broad money in its desired long run track. Cash reserve ratio (CRR) and statutory liquid ratio (SLR) for scheduled banks are the other monetary policy tools, used sparingly in situations of drastic imbalances stem from major shocks. In the back drop of necessity reverse repo operations are also being used sparingly to keep credit condition on its intended path in different sectors like agriculture, large and SME industries. (Monetary Policy Stance (MPS), BB, H1:2010)

Since monetary policy goals cannot be influenced directly, like most central banks BB uses a set of indirect instruments. As described above, the M2 can be influenced

indirectly by changes in policy instruments that target and monitor the RM via the money multiplier (MM). The primary mechanism employed for this purpose is the direct control of liquidity on a day-to-day basis achieved by the repo, reverse-repo, occasional BB Bills and the T-bill auctions for different tenures such as 28-days, 91-days, 182-days and 364-days, 3-years, 5-years and 9-years. The later instruments would in turn have an impact on the inter-bank call money rate for overnight transactions, which is the equivalent of the federal funds rate in the US. Usually, BB uses all avenues of policy options simultaneously to influence the credit market. Figure 2 is showing the co-movement of some selected policy rates in this regard which are highly synchronized i.e. policy actions by BB is always highly harmonized so that a concrete influence can take place.

**Figure 2: The co-movement of some selected policy rates.**



It is also noteworthy that the BB has been encouraging the activation of the inter-bank call money market instead of the reliance of commercial banks on the rediscount window the central Bank. As the time lag between policy actions and the eventual impact on goals is usually perceived as a short term, additional information variables such as foreign reserves, short-term interest rates, liquidity situation and domestic credit growth appear handy for BB to adapt and revise its policy measures if and as needed. As interest rate path is determined by the market forces which sometimes works whimsically BB does not rely on it and tries to control money and credit supply in the economy.

Consequently, the BB puts greater reliance on monetary targeting focused on the RM, and thus via the mm, on broad money, i.e., M2,. Therefore, BB programs the required limit of monetary expansion, M2 in this case, based on estimates of GDP growth, Consumer Price Index (CPI) and changes in the income velocity of money (v). The simple relationship between M2 and RM (see appendix 1 & 2) allows the later to be used

as an intermediate target, which is convenient since the policy instruments may directly target RM effectively. While the details of the instruments and modalities are described above, note that the essence of this approach relies on routinely (BB does it in daily basis) monitoring and influencing the supply of liquidity in the private credit market that would be consistent with BB's judgment of the inflation and GDP outlook. That is, the success of this strategy squarely depends on a good understanding of the underlying inflationary process and the GDP forecast built into the target money stock growth. The above process also postulates that interest rate strategy becomes a tertiary policy of BB which ultimately makes it a less useful tool of monetary policy in Bangladesh.

## Data

Our data set covers the quarterly series of repo, reverse repo, special repo and liquidity support rates, 28-day, 91-day, 182-day, 364-day T-Bill, and occasional BB bill rates, lending, deposit and call money rates for the period of 2003,Q1 - 2015,Q4. Here, all data are weighted average in nature. By using this data set we have derived weighted average policy rate (WAPR) that was virtually applied during this period. During calculation of weighted average rate we have given the weight for each of the item above as per their volume or quantity. The formula for calculating the WAPR is as follows:

$$\text{WAPR} = \frac{\sum (\text{Rate} \times \text{Amount})}{\sum (\text{Amount})}$$

We believe that an weighted average rate calculated by the above way and formula can give us a representative policy rate applied for the economy. Again the time period (2003-2015) is selected because of availability of data and BB started repo, reverse repo and special repo operation from first quarter of 2003 with a view to regular market fine tuning. Market was properly deregulated (for example floating exchange rate introduced in May, 2003) from that period as well. So, it is perceived that true application of modern techniques of monetary policy or open market operation (OPO) have been started to apply from early 2003. So, we have used all the data of the variables used for the purpose of controlling money supply and interest rates of the economy. It would have been better if we could have use monthly data. But unfortunately data of all required variables are not available in monthly frequency. Sample size of the data for the above period constitutes a size of 52 which is fairly large. This sample can be considered asymptotic in line with Gujrati (2003; Page 485) criterion that a sample size 50 or more observations is considered plausibly large. Therefore, our sample size is reasonably large for empirical analysis. Data source is various issues of monthly and quarterly publications of Statistics Department of BB which are various issues of Economic Trend, BB Bulletin and Bangladesh Bank Quarterly (BBQ).

## Literature Review

Techniques and results of the various studies are different and mix in nature. Here we have focused on only some studies whose basis was Bangladesh. We did not include any foreign study in this review section to keep the paper in a reasonable size.

Zaman et. al. (2007) has shown that policy rates and call money rate in Bangladesh have long run cointegrated. Using monthly data of from 2003 to 2007 of repo and reverse repo rates as proxy rates of policy rate and GARCH model as tool of analysis they have shown that if any volatility arises in the call money market for some reason it corrects swiftly and come in the equilibrium trend. However, the paper did not focused on the influence of the policy rates on other important ultimate rates like lending and deposit rate of the economy and also did not presented any concrete revelation about the speed and magnitude of the pass-through of policy rate to call money rate.

Islam (2008) has shown that controlling the RM and M2 by using SLR, CRR, repo, reverse repo and other open market operation is failed due to autonomous character of the two important components of RM - government borrowing from central bank (NCTG) and Net Foreign Assets (NFA). Using quarterly data of 1979,Q3 - 1997,Q2 and Structural Vector Autoregression Model he found that BB has no virtual control over base and broad money of Bangladesh. However, he did not focused on the influence and consequence of any interest rate changes of the market.

Akhtar et. al. (2005), has found that call money rates suffers from high volatility particularly in festival season in Bangladesh when excess reserve of the banks with BB falls sharply. Their assessment also pointed out that such hyper volatility in the call money market in Bangladesh is due to lack of efficiency in liquidity management by commercial banks of the country which can be mitigated by a small reduction of long term investment by the banks. They have also mentioned that proper guidance by BB is also necessary in this regard.

Ahmed et.al. (2006), has shown that besides reform of legal, institutional and policy framework through Financial Sector Reform Program (FSRP) in early 1990s empirical investigation says that bank lending and exchange rate channel have very weak impact on transmission channel of aggregate output and price level. The paper puts this empirical evidence by using the unrestricted vector autoregressions (VARs) approach using quarterly data for the period of July-September 1979 to April-June 2005. This paper also did not evaluate the consequence of changing policy rates on deposit and call money rates of Bangladesh. Further, they did not assess the magnitude and speed of influence of policy changes on lending and exchange rates as well.

Yunus (2006) examines whether monetary policy transmits through bank assets or liabilities or both. The sample period covered in the study is 1976:3 to 2004:1. Quarterly data are employed to see the trend and correlation among the monetary policy (measured by the M2 supply, bank deposits or credit) and other macroeconomic variables e.g., the nominal exchange rate and real GDP growth in Bangladesh. Monetary policy shows close relationship with bank deposits and credit. In other words, by the correlation matrix and trend analysis she shows that both the money channel and the credit channel operate in Bangladesh very well. A major weakness of this paper is that it did not use any econometric model and the intention of the paper was not analysing interest rate dynamics of monetary policy rather the consequences of monetary policy changing in real sector indicators of the economy.

All the paper above suffers from procedural deficiency and coverage of data period and issues focused (speed, magnitude of IRPT etc.). So, our paper contemplates to overcome these lacks. Analysis of IRPT is a hot and voluminous issue among researchers around the world. However, for Bangladesh it is quite nascent. This paper differs from the earlier of them regarding data used, econometric techniques applied and area of issues covered. Therefore, contribution of this paper is filling of existing literature gaps in the concerned field of Bangladesh.

### **Relationships to be Tested**

We are in an attempt to test a set of questions and hypothesis relating to the interests rate pass-through. First of all, whether monetary policy rate transmits to market interest rate i.e. is there any one to one correlation between the policy rate and to the market rates? The second one is that whether changes in policy rates have any influence on banking sector retail rates i.e. on deposit rate and lending rate of the banks? The third type of hypothesis is that the magnitude, speed and symmetrical or asymmetrical nature of the IRPT of the monetary policy in Bangladesh. Therefore, our hypotheses are as follows:

- 1)  $H_0$  : Policy Rates have influence on Money Market Rates (Call Money Rate).
- 2)  $H_0$  : Policy Rates have influence on Bank Retail Rate (Deposit and Lending Rate)
- 3)  $H_0$  : The above two relations are complete, not sluggish and symmetric.

### **Methodology**

Post Keynesian structuralist theory stresses endogeniety of money supply in terms of bank lending channel. This theory specifies that money supply is endogenously determined by demand for commercial banks credit. Therefore, this theory puts emphasis

on evaluation microeconomic behaviour of profit seeking commercial banks and their reaction to changes in credit market conditions. However, two necessary conditions have to be satisfied for bank lending channel to operate. First, bank loans and market finance (commercial paper, bonds etc.) have to be imperfect substitutes. Otherwise, the lack of bank lending would be compensated by firms through issue of securities in financial market. Second, banks have to react to liquidity shortages by cutting down their lending and/or keeping low required reserve to central bank. In other words, if banks react to a restrictive monetary policy simply by issuing additional certificates of deposits the bank lending channel cannot operate (Freixas and Rochet, 2008).

Now, in line with above model assume that banks balance sheet is given by the following equation:

$$\text{Reserve (R)} + \text{Loan (L)} = \text{Deposit (D)} + \text{Paid up Capital (PK)}$$

$$\text{So, } D = R + L - PK$$

Assume that commercial banks provide loans and get deposit at the rate of interests at  $i_l$  and  $i_d$  respectively. Then

$$\text{Net Interest Income} = i_l L - i_d D = i_l L - i_d (R+L-PK)$$

Again, assume that, like a standard, competitive and well functioning financial system, the demand for loans has a downward sloping function for banks and demand for deposits is an upward sloping function. As clearing is conducted through central bank, commercial banks whose balance falls below the required reserves have to pay a liquidity penalty  $i_p$  equivalent to the official policy rate multiplied the difference between required reserves (R) and balance after clearing settlement or actual reserve ( $\tau R$ ) where  $0 < \tau < 1$ . Therefore, total penalty is given as

$\pm i_p (R - \tau R)$ ; here the sign is  $\pm$  as when actual reserve is higher than required level, bank will have gain net interest from the central bank and opposite will be in case of shortfall.

Considering banks loan management marginal costs at the rate of  $\Phi$  (which is a constant in short run)

$$\text{Total loan management cost} = \Phi L$$

So, the profit maximisation function  $\pi(L,R)$  is derived from combining equations above

$$\pi(L,R) = i_l L - i_d (R+L-PK) \pm i_p (R - \tau R) - \Phi L$$

profit maximising commercial banks equate their marginal revenue to marginal cost. Therefore, first order conditions with respect to L and R yields:

$$\delta\pi (L,R)/\delta L = i_l - i_d - \mu = 0; \Rightarrow i_l - i_d = \Phi$$

$$\delta\pi (L,R)/\delta R = i_d \pm i_p\tau = 0; \Rightarrow i_d = \pm i_p\tau$$

Substituting  $i_d$  from the first condition we have  $i_l \pm i_p\tau = \Phi$  which means that

$i_l = \Phi \pm i_p\tau$ ; this is the equation what gives us a basic foundation of the empirical investigation which says that, largely, Lending Rate ( $i_l$ ) is a linear function of central bank policy rate. In other words

$$\text{Lending Rate} \Rightarrow LR = \alpha_1 + \beta_1 PR. \dots\dots\dots(6)$$

The same of impact Policy Rate is supposed to fall on Deposit Rate as well. Therefore, Deposit Rate function can be written as

$$\text{Deposit Rate} \Rightarrow LR = \alpha_2 + \beta_2 PR. \dots\dots\dots(7)$$

Similarly the impact policy rate is believed to fall on call money rate and in that case mathematical function for call money rate should be as follows:

$$\text{Call Money Rate} \Rightarrow CMR = \alpha_3 + \beta_3 PR \dots\dots\dots(8)$$

**Estimation Techniques**

Based on the perception of the existing literature techniques at first we use Least Square Estimation (LSE) method for running regression to determine the long run relationship among dependent variables (deposit, lending and call money rate) and independent variable (WAPR). As monetary policy is short term in nature most of the research papers have used Error Correction Model (ECM) or Vector Error Correction Mechanism (VECM) techniques for estimation purpose and to determine whether any short run relationship is there in the IRPT process. In case of ours' after investigation of the LSE model we have detected violation of the assumptions of the Classical Linear Regression Model (CLRM) techniques which means estimated parameters (i.e. estimated long-run relationship) are spurious and subsequently we have tried to remedying the violations. We have used Generalized Methods of Moments (GMM) techniques where CLRM assumptions are not necessary. By solving assumption problems of CLRM to establish the LSE parameters as the long-run estimator of the IRPT, we have resorted Augmented Dickey-Fuller (ADF) test to determine the presence of unit root for all the individual time series variables. According to the unit root test results we have understood that instead of

ARDL Model, Johansen or Engle-Granger (EG) test can be applied to confirm the co-integration between two variables. After that we have relied on ECM model to investigate the short-run dynamics. And then we have resorted VECM IRF of Choleski S.D. Innovation and Wald coefficient test method to measure the speed and magnitude of the IRPT. Finally, we are also confirmed by LSE of CLRM, Engle-Granger (EG) and ECM method that IRPT in Bangladesh is symmetric.

### Unit Root Test

Before applying OLS we have checked the Stationarity of our time series variables through Phillips-Peron and Augmented Dickey-Fuller Unit Root Tests. The result of the Stationarity of the variables are reported in the following table 01 where figure inside the parentheses are probability of the test statistic:

| Variables in Level        | PP Test         |                        | ADF Test        |                        | Decision     |
|---------------------------|-----------------|------------------------|-----------------|------------------------|--------------|
|                           | With Intercept  | With intercept & Trend | With Intercept  | With intercept & Trend |              |
| Weighted Policy Rate (PR) | 3.61<br>(0.01)  | 3.56<br>(0.04)         | 3.48<br>(0.01)  | 3.56<br>(0.04)         | No Unit Root |
| Lending Rate (LR)         | 2.20<br>(0.21)  | 2.40<br>(0.34)         | 2.81<br>(0.06)  | 3.81<br>(0.02)         | No Unit Root |
| Deposit Rate (DR)         | -3.71<br>(0.04) | -4.63<br>(0.01)        | -4.05<br>(0.01) | -5.32<br>(0.01)        | No Unit Root |
| Call Money Rate (CMR)     | -4.30           | -4.21                  | -4.30           | 4.25                   | No Unit Root |

The result of the unit root tests show that all of the concerned variables are stationary at levels. As all the variables are stationary at levels we decided to apply LS regression method for running regression of our derived models above. So, first and foremost, we have estimated LSE regression by using the following econometric equations:

$$\text{For Lending, } LR = \alpha_1 + \beta_1 PR + u_1 \text{-----(9)}$$

$$\text{For Deposit, } LR = \alpha_2 + \beta_2 PR + u_2 \text{-----(10)}$$

$$\text{For Call Money Rate, } CMR = \alpha_3 + \beta_3 PR + u_3 \text{-----(11)}$$

where  $\alpha_i$  are intercepts,  $\beta_i$  are the estimated parameters and  $u_i$  are the error terms of the lending and deposit channels of the IRPT respectively. The results are summarized in the following table:

**Table 1: Results of the LSE of CLRM**

Dependent Variable: LNLR, LNDR & LNLCMR

Sample: 2003Q1 2015Q4

Included observations: 52

|                          | Lending Rate | Deposit Rate | Call Money Rate |
|--------------------------|--------------|--------------|-----------------|
| Intercept                | 2.27         | 1.59         | 1.07            |
| t-statistic              | 49.01        | 18.13        | 3.32            |
| (Prob.)                  | 0.00         | 0.00         | 0.00            |
| Policy Rate              | 0.13         | 0.19         | 0.56            |
| t-statistic              | 5.23         | 4.00         | 3.17            |
| (Prob.)                  | 0.00         | 0.00         | 0.00            |
| R-squared                | 0.36         | 0.25         | 0.17            |
| Adj. R -squared          | 0.35         | 0.23         | 0.15            |
| Durbin -Watson Statistic | 0.41         | 0.25         | 1.39            |

The different test applied to confirm the validity of all assumptions of CLRM and our results are positive except autocorrelation and normality of the error terms of above three regression models. The presence of autocorrelation can be traced by the given D-W Statistic ( $< 2.00$ ) as well. By using Correllogram Squared Residuals and Serial Correlation LM (Lagrange Multiplier) Test we confirmed about autocorrelation and by using Histogram Normality Test we could detect positive non-normality in the residuals of the above regression models. Again, for non-normality of the error terms we have performed some econometric tests like Jarque-Bera (J-B) test where Null Hypothesis  $H_0$  : Normal Distribution Error is Present. The results are given summarized in table 2.

**Table:2 Jarque-Bera (J-B) Test :**

|                               | Lending Rate | Deposit Rate | Call Money Rate |
|-------------------------------|--------------|--------------|-----------------|
| Jarque -Bera (J -B) Statistic | 0.61         | 0.18         | 57.90           |
| Probability                   | 0.74         | 0.91         | 0.00            |

The non-normality of errors for the LNLCMR regression is not considered to have an impact on our analysis because the data is considered to be asymptotic. As Brooks (2008, P 164) points out, for sufficiently large samples, the normality-of-errors assumption is virtually inconsequential based on the central limit theorem. This is reinforced by Gujrati (2007, p. 364) with the additional comment that it is vital to assume fixed exogenous variable values in repeated trials and homoskedasticity (error variance to be constant).

Breusch-Godfrey Serial Correlation LM (Lagrange Multiplier) Test (where Null Hypothesis  $H_0$  : Autocorrelation is Present) result is reported in Table 3. By the result we are confirmed that the above three LSE regressions are suffering from the presence of autocorrelation.

**Table:3 Breusch-Godfrey Serial Correlation LM Test**

| Lending Rate    |       |                      |      |
|-----------------|-------|----------------------|------|
| F-statistic     | 37.86 | Prob. F(2,48)        | 0.00 |
| Obs*R -squared  | 31.83 | Prob. Chi -Square(2) | 0.00 |
| Deposit Rate    |       |                      |      |
| F-statistic     | 70.46 | Prob. F(2,48)        | 0.00 |
| Obs*R -squared  | 38.79 | Prob. Chi -Square(2) | 0.00 |
| Call Money Rate |       |                      |      |
| F-statistic     | 3.34  | Prob. F(2,48)        | 0.04 |
| Obs*R -squared  | 6.35  | Prob. Chi -Square(2) | 0.04 |

After detection of the presence of autocorrelation we then depend on GMM estimation where for a large sample violation of CLRM assumption does not capable to hinder getting BLUE statistic. In GMM estimation we have got very small but significant coefficient of LNWPR which means that we have got WPR has long run effect on lending, deposit and call money rate in Bangladesh.

Dependent Variable: LNLR, LNDR & LNCLR

Method: Generalized Method of Moments

Sample: 2003Q1 2015Q4

Included observations: 52

Linear estimation with 1 weight update

Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Standard errors & covariance computed using estimation weighting matrix

Instrument specification: LNDR, LNLR and Constant term C respectively

| Variable                 | Lending Rate | Deposit Rate | Call Money Rate |
|--------------------------|--------------|--------------|-----------------|
| Coefficient of LNWPR     | 1.40         | 1.71         | 1.16            |
| Std. Error               | 0.05         | 0.04         | 0.05            |
| t-Statistic              | 30.00        | 30.49        | 24.45           |
| Prob.                    | 0.00         | 0.00         | 0.00            |
| R-squared                | -30.10       | -5.09        | -0.02           |
| Adj. R -squared          | -30.10       | -5.09        | -0.02           |
| Durbin -Watson Statistic | 0.71         | 0.71         | 1.38            |

In case of GMM estimation above we have chosen Inverse of Excess Liquidity as instrumental variable as excess liquidity and WPR are inversely related meaning that high excess liquidity lessens WPR and vice versa. Correlation between Inverse of Excess Liquidity and WPR is very strong 0.74 i.e. selection criteria of Instrumental Variable for GMM is satisfied. Again correlation between Three Error Terms series and Inverse of Excess Liquidity are very low which are as follows:

**Table: 03 Correlation of Inverse of Excess Liquidity with Error Term of Equations 09, 10 & 11.**

| Correlation of Inverse of Excess Error Term of Liquidity with | Correlation Co-efficients | Prob. of J Statistic |
|---|---------------------------|----------------------|
| Equation 09   | +0.03                     | 0.33                 |
| Equation 10   | -0.02                     | 0.45                 |
| Equation 11   | -0.11                     | 0.27                 |

Theoretically, correlation coefficients between Instrumental Variable and Error terms of OLS estimations should be zero but in real case getting zero correlation coefficient is very rare. However, Correlation Co-efficients presented in table 03 are very close to zero means that Orthogonality condition is also satisfied. Probability of the J Statistics are also quite large.

After GMM regression we have relied another type of econometric method (EG test) to check the long run relationship between WPR and our concerned three dependent variables. To perform that test at first we have conducted the ADF test to test for the presence of a unit root in determining the stationarity of each individual series in levels. The results confirm that all the variables are stationary in levels i.e. they are I(0). Result of Unit Root Test is given in table 3.

**Table 03: ADF Test in Level (Null Hypothesis H0: Unit Root)**

| Augmented Dickey-Fuller test statistic | t-Statistic | Prob. |
|--|-------------|-------|
| LNLR                                   | -2.81*      | 0.06  |
| LNDR                                   | -3.22**     | 0.03  |
| LNCMR                                  | -4.30***    | 0.00  |
| LNWPR                                  | -3.48**     | 0.01  |

\*, \*\* and \*\*\* are significant at 10, 5 and 1% level of Significance

Next, the errors ( $u_1$ ,  $u_2$  and  $u_3$ ) generated from equations (1), (2) and (3) are tested separately using the ADF. The results show that all four regression errors are stationary in levels, confirming the combined integration. Table 4 reveals these findings.

**Table 04: ADF Test in Level (Null Hypothesis H0: Unit Root)**

| Augmented Dickey-Fuller test statistic | t-Statistic | Prob. |
|--|-------------|-------|
| u <sub>1</sub>                         | -7.09***    | 0.00  |
| u <sub>2</sub>                         | -6.15***    | 0.00  |
| u <sub>3</sub>                         | -5.00***    | 0.00  |

\*, \*\* and \*\*\* are significant at 10, 5 and 1% level of Significance

After confirming unit root for all residual terms at level then the EG test is carried out to confirm the co-integration between the variables of each equation. The first step is to run the CLRM and estimate the error (residual) series u<sub>1</sub>, u<sub>2</sub> and u<sub>3</sub> for the lending, deposit and call money rate channels, respectively. These series have already been estimated in equations (12), (13) and (14). The second step is to run the following auxiliary regressions:

Lending,  $\Delta u_1 = \gamma_1 u_{1t-1} + e_1$  .....(12)

Deposit,  $\Delta u_2 = \gamma_2 u_{2t-1} + e_2$  .....(13)

Call Money Rate,  $\Delta u_3 = \gamma_3 u_{3t-1} + e_3$  .....(14)

Where  $\Delta$  represents the first difference between the error values calculated from equations (12), (13) and (14), the  $\gamma$  terms are the computed t-statistic values calculated using the EG test, and  $e_1$ ,  $e_2$  and  $e_3$  are the residuals from the auxiliary regression of the lending, deposit and call money rate channels, respectively. The results of the second step of the EG test are placed in Table 5.

**Table 5: Results of Engle- Granger (EG) Test**

|             | Lending Rate | Deposit Rate | Call Money Rate |
|-------------|--------------|--------------|-----------------|
| u           | -0.50***     | -0.15**      | -0.72***        |
| t-statistic | -2.65        | -2.44        | -5.32           |
| Prob.       | 0.010        | 0.02         | 0.00            |

\*, \*\* and \*\*\* are significant at 10, 5 and 1% level of Significance

The computed values are negative (as mentioned in the literature) and significant relative to the 1 and 5 percent critical values. The regressions in equations (12), (13) and (14) are, therefore, cointegrated, confirming that the results of LSE too were not spurious. The regression coefficients or  $\beta$  terms estimated from equations (12), (13) and (14) can be considered long-run parameters and, hence, there is equilibrium at least in the long run.

Now we shall turn our eyeballs for short run influence of WPR on these three dependent variables. Having confirmed the co-integration, we apply an ECM to estimate the short-

run parameters, using the following regressions:

$$\text{Lending,} \quad \text{LR} = \mu_1 + \lambda_1 \Delta\text{WPR} + \theta_1 u_{1t-1} + \varepsilon_{1t} \dots \dots \dots (15)$$

$$\text{Deposit,} \quad \text{DR} = \mu_2 + \lambda_2 \Delta\text{WPR} + \theta_2 u_{2t-1} + \varepsilon_{2t} \dots \dots \dots (16)$$

$$\text{Deposit,} \quad \text{CMR} = \mu_3 + \lambda_3 \Delta\text{WPR} + \theta_3 u_{3t-1} + \varepsilon_{3t} \dots \dots \dots (17)$$

where  $\Delta$  represents the first difference between the current and lagged values of LR, DR and CMR; the  $\lambda$  terms are the slope coefficients;  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  and  $\varepsilon_{3t}$  are the first-lag error values estimated from equations (12), (13) and (14), respectively; and  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  and  $\varepsilon_{3t}$  are the residuals from equations (15), (16) and (17) respectively. Table 6 gives the empirical parameters of the ECM.

**Table 6: Results of ECM Models**

|                         | Lending Rate | Deposit Rate | Call Money Rate |
|-------------------------|--------------|--------------|-----------------|
| Intercept               | 2.51         | 1.93         | 2.07            |
| t-statistic             | 371.62       | 224.67       | 78.11           |
| (Prob.)                 | 0.00         | 0.00         | 0.00            |
| Weighted Policy Rate    | 0.04*        | 0.05*        | 0.16*           |
| t-statistic             | 1.80         | 1.79         | 1.80            |
| (Prob.)                 | 0.08         | 0.08         | 0.08            |
| ut-1                    | 1.04***      | 1.11***      | 1.02***         |
| t-statistic             | 8.81         | 13.58        | 15.50           |
| (Prob.)                 | 0.00         | 0.00         | 0.00            |
| R-squared               | 0.62         | 0.79         | 0.83            |
| Adj. R-squared          | 0.60         | 0.79         | 0.83            |
| Durbin-Watson Statistic | 0.56         | 0.54         | 0.55            |

\* & \*\*\* indicate significant at 10 & 1% level of Significance respectively

The above findings reveal that the errors are significant even at a 1 percent level of significance, thus reconfirming the use of the estimated  $\Delta\text{WPR}$  parameters as short-term pass-through estimates. The findings indicate the impact on the endogenous variables in the short-run based on a 1 percent increase in the weighted policy rate proxy or policy shock.

To confirm whether there is a complete pass-through in market retail rates due to a policy shock in the long-run, the estimated parameters ( $\beta$  terms) of market lending and deposit rates from equations (12), (13) and (14), respectively, are tested using the Wald coefficients test (Table 7).

**Table 7: Wald test where Null Hypothesis  $H_0: \beta_i = 1$  and  $i=1,2 \& 3$** 

|                 | Test Statistic | Value   | df      | Probability |
|-----------------|----------------|---------|---------|-------------|
| Lending Rate    | t-statistic    | 34.30   | 50      | 0.00        |
|                 | F-statistic    | 1176.33 | (1, 50) | 0.00        |
|                 | Chi-square     | 1176.33 | 1       | 0.00        |
| Deposit Rate    | t-statistic    | 16.85   | 50      | 0.00        |
|                 | F-statistic    | 283.81  | (1, 50) | 0.00        |
|                 | Chi-square     | 283.81  | 1       | 0.00        |
| Call Money Rate | t-statistic    | 2.48    | 50      | 0.02        |
|                 | F-statistic    | 6.13    | (1, 50) | 0.02        |
|                 | Chi-square     | 6.13    | 1       | 0.01        |

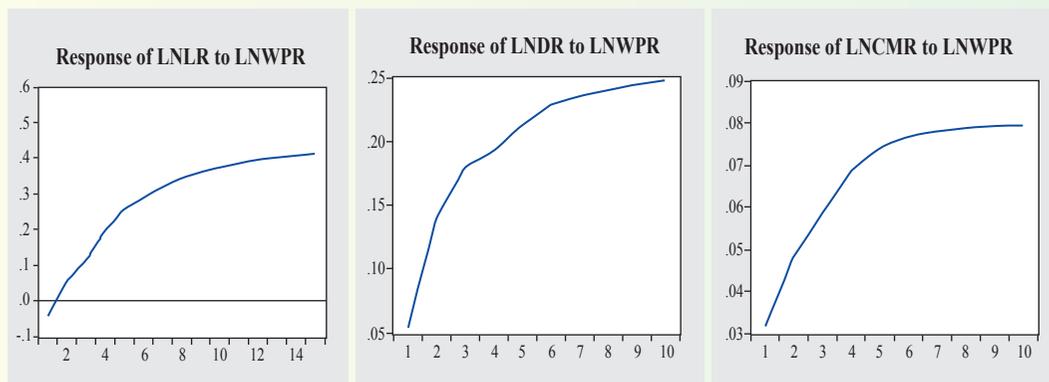
The Wald coefficient test's null hypothesis implies interest rate pass-through ( $H_0: \beta=1$ ) to market retail rates in the long run. The results reveal that the estimated parameters in table 1 are not any of them equal to 1. Hence, complete pass-through from a policy shock to Bangladesh's financial system in the long run does not hold among for the lending, deposit and call money rate channels, as indicated by the probability values in Table 7. We, therefore, we can reject the null hypothesis of complete pass-through to market retail rates. This result is also supported by the correlation matrix (table 8) analysis. Cross correlations are good indicators to measure the degree of pass-through between contemporaneous data (Amarasekera, 2009). The correlation matrix given bellow shows that both deposit and lending rate has from moderate to high correlation with WP Rate. It is also worth to mention that lending and repo rates are close correlated with deposit and reverse repo rates respectively. It is very obvious because the deposit rate is expected has an effect on lending rate, as deposit rate makes up a part of bank's cost of funds.

**Table 8: Correlation Matrix Among Retail and Policy Rates in Bangladesh**

|                 | Lending Rate | Call Money Rate | Deposit Rate | REPO Rate | Rev. REPO Rate | Bank Rate | WP Rate |
|-----------------|--------------|-----------------|--------------|-----------|----------------|-----------|---------|
| Lending Rate    | 1.00         |                 |              |           |                |           |         |
| Call Money Rate | 0.06         | 1.00            |              |           |                |           |         |
| Deposit Rate    | 0.91         | 0.02            | 1.00         |           |                |           |         |
| REPO Rate       | 0.34         | 0.08            | 0.24         | 1.00      |                |           |         |
| Rev. REPO Rate  | 0.49         | 0.08            | 0.48         | 0.86      | 1.00           |           |         |
| Bank Rate       | 0.17         | -0.11           | -0.18        | 0.17      | -0.11          | 1.00      |         |
| WP Rate         | 0.65         | 0.22            | 0.54         | 0.51      | 0.41           | 0.46      | 1.00    |

Finally, we use the VECM Impulse Response Function (IRF) to determine the speed of the short-run pass-through. Figure 1 shows its estimated duration and the variations in the endogenous variables due to a weighted policy rate shock of 100 bps (1 percent).

**Figure 1: Response to Choleski one S.D. Innovations**



We were in attempt to measure short run speed of the IRPT by Choleski one SD Innovation method. We have got that, on average, a 100 bps increase in the WPR leads to a 40 bps (approx) increase in the incremental LNLN over more than 12 quarters, which is thereafter consolidated at this level almost after 3 year (approx). A 100 bps policy shock leads, on average, to a 25 bps (approx) increase in the LNDR over 8 quarters (approx) means 2 years are needed for full affect come into validation. Finally, A 100 bps policy shock leads, on average, to a 8 bps (approx) increase in the LNCMR over 6 (approx) quarters i.e 1.5 years needs to impact come.

### **Inference and Decision**

In Bangladesh monetary policy is formulated in June/July during inception of the fiscal year (FY) and if necessary is revised in January. Usually it is devised keeping coherence with fiscal stance so that inflation and output growth rates - the basic policy targets- are achieved. The stance of monetary policy is revealed through rule based monetary aggregates targets such as RM, M2 and domestic credit (both credit to private sector (CPS) and NCTG) which are projected, monitored and controlled to achieve desired real sector targets of the economy. Such program growth targets and actual growth performance (year on year) for last few years are shown in the following table 9.

**Table 9: Program and Actual levels of some key monetary indicators of Bangladesh for 2004-16.**

|      |        | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NFA  | Actual | 16.3 | 14.2 | 7.8  | 49.4 | 15.1 | 27.2 | 34.6 | 6.2  | 7.8  | 50.1 | 38.6 | 21.3 | 21.7 |
|      | Prog.  | 13.0 | 10.0 | 15.7 | 12.5 | 25.5 | 14.1 | 27.9 | 4.2  | -1.6 | 0.9  | 14.0 | 16.8 | 11.1 |
| NDA  | Actual | 13.4 | 17.1 | 19.7 | 12.5 | 18.1 | 17.8 | 15.8 | 24.7 | 19.2 | 11.1 | 10.1 | 9.9  | 11.6 |
|      | Prog.  | 11.8 | 14.8 | 15.2 | 15.9 | 10.5 | 18.1 | 13.1 | 17.6 | 22.1 | 19.0 | 18.4 | 16.4 | 16.2 |
| RM   | Actual | 7.6  | 13.0 | 28.1 | 17.7 | 20.6 | 31.9 | 17.1 | 21.1 | 9.0  | 15.0 | 15.4 | 14.3 | 20.9 |
|      | Prog.  | 8.5  | 11.0 | 11.5 | 12.5 | 12.0 | 17.2 | 7.0  | 13.0 | 16.0 | 13.8 | 16.1 | 15.9 | 14.3 |
| DC   | Actual | 11.9 | 17.5 | 20.5 | 19.9 | 21.8 | 15.9 | 18.4 | 27.5 | 19.2 | 10.9 | 11.6 | 10.1 | 13.2 |
|      | Prog.  | 11.4 | 15.0 | 17.0 | 15.5 | 13.4 | 20.4 | 15.6 | 17.9 | 20.0 | 18.6 | 18.9 | 17.4 | 15.5 |
| NCTG | Actual | 7.8  | 17.2 | 27.0 | 14.4 | 11.8 | 23.2 | 9.4  | 34.6 | 17.4 | 11.1 | 8.8  | -2.5 | -2.4 |
|      | Prog.  | 17.7 | 17.7 | 26.5 | 21.7 | 16.5 | 27.3 | 13.8 | 25.3 | 28.1 | 20.8 | 20.3 | 24.8 | 18.7 |
| CPS  | Actual | 10.3 | 17.0 | 18.3 | 15.1 | 24.9 | 14.6 | 21.1 | 25.8 | 19.7 | 10.8 | 12.3 | 13.2 | 16.4 |
|      | Prog.  | 12.0 | 14.8 | 14.5 | 14.4 | 15.4 | 18.5 | 16.7 | 16.0 | 18.0 | 18.0 | 18.5 | 15.5 | 14.8 |
| M2   | Actual | 13.8 | 16.8 | 19.5 | 17.0 | 17.6 | 19.2 | 18.8 | 21.4 | 17.4 | 16.7 | 16.1 | 12.4 | 14.0 |
|      | Prog.  | 11.9 | 14.2 | 14.3 | 15.5 | 15.0 | 17.5 | 15.5 | 15.2 | 18.5 | 16.5 | 17.7 | 16.5 | 15.0 |

According to the desired targets BB tries to inject high powered money and credits to the economy which are nominally anchored at the initial stage of the FY. However, keeping all variables always within target levels can't be kept because of autonomous nature of some indicators (such as NFA, NCTG etc.). By this tactic of monetary policy it is clear that interest rate is not an adopted and espoused policy by BB.

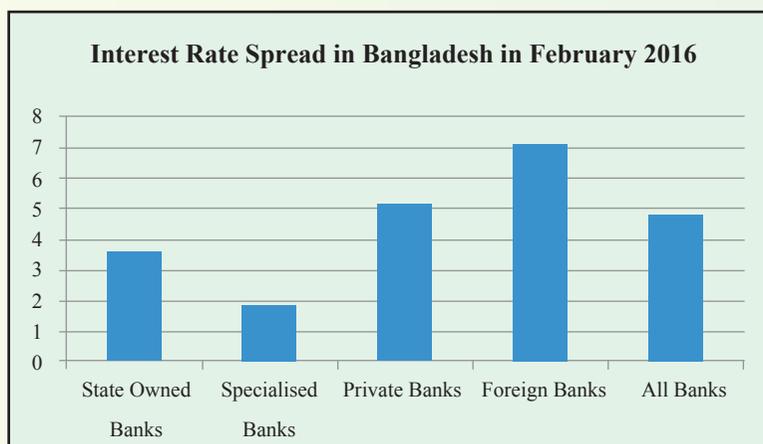
In the above backdrop where interest rate channel is not a handy and useful arm for BB. The empirical importance IRPT research has very little use value. However, among various channel we are in attempt in this research to examine just the accuracy of interest rate pass-through in case of Bangladesh. We have focused here only about the efficacy, magnitude and speed of IRPT channel of monetary policy in Bangladesh.

We have found evidence that, the speed of pass-through in the short run for the LR, DR and CMR is very low, incomplete and sluggish which is reinforced by the ECM's short-run parameter for the LR, DR and CMR as well. Further, BB intention for repo, reverse repo, liquidity support, special repo, T-Bills and T-Bond operation is only to manipulate that call money rate of the money market. So, clearly DR and LR is out in focus of the BB's interest rate policies though occasionally it apply practice of moral suasion to keep interest rates in a reasonable position.

Moreover, in economies where fiscal indiscipline is high and gradual accumulation non-performing loan is paramount, as in Bangladesh's case, the pass-through for lending rates is incomplete mainly because banks are unable to cut down lending rate as per central

bank policy signal. In every econometric tests above coefficients related to deposit rate is higher than coefficient of lending rate which means banks are adjusting the deposit rates more quickly than central bank policy rates than lending rate. Additionally, the spread of the banking sector stands at high levels ( about 5 percent) between the LR and DR, again indicating the inefficiency, low degree of competition and also lack of regulatory efficiency in Bangladesh's banking sector.

**Figure 6: The IRS in State-owned & Specialized, Private and Foreign banks in Bangladesh in Feb. 2016**



**Source:** Statistics Department of Bangladesh Bank

In addition to the above, due to the injection of funds intermittently by government to state-owned banks (Particularly for Sonali, BASIC, Bangladesh Krishi Bank and Rajshahi Krishi Unnoyan Bank (RAKUB) the banking industry has been experienced several state sponsored market distortions. This has resulted in lower competition within the banking system and has induced banks not to pass on the increase in policy rate to their deposit and lending rates.

Further, at the same time, central bank is offering different refinance scheme for entrepreneurs ( i.e. SME, EEF, Agricultural loan etc.) with mandatory low rates which is another market distortion that hinders interest rate signals in the market.

The above may be the possible reasons for the incomplete and low profile pass-through in the lending and deposit channels.

## Conclusion

A well-functioning financial sector is of course essential for an effective transmission of monetary policy. Such transmission is achieved through various channels or mechanisms.

The same channel is not equally effective in all countries or at all times. As analysis of all channels is a gigantic job we here evaluated only one channel - interest rate channel. It is very obvious that influence of policy rates will be quickly reflected in bank retail rates to eventually influence the aggregate demand and inflation scenario of the economy. Only then applying of monetary policy will be able to offset turmoil arises for different shocks in the economy i.e. a good knowledge on the transmission mechanisms is essential for successfully conducting monetary policy in the future. As Mishkin (1995) said, "Monetary policy is a powerful tool, but one that sometimes has unexpected or unwanted consequences. To be successful in conducting monetary policy, the monetary authorities must have an accurate assessment of the timing and effect of their policies on the economy, thus requiring an understanding of the mechanisms through which monetary policy affects the economy". So, we need to know cogency of the pursuing monetary policy. We believe that the bank lending or deposit channel i.e. credit channel to be the most important transmission mechanism of monetary policy, especially in a developing country like Bangladesh. In light of above importance of credit channel of monetary policy we have tried to examine effectiveness of monetary policy through analysing IRPT in Bangladesh.

Our analysis says that the interest rate pass-through from a policy shock to the market lending, deposit and money market rates is significant both in short and long run albeit incomplete and very tiny in Bangladesh, even in the long run. The empirical evidence is that changes in the policy rate have a significant but very little reaction or impact on the lending, deposit and market rates. Although the pass-through on the lending rate channel is reasonably higher (40 percent) than on the deposit and market rate, it remains inconsequential particularly for money market channel. The speed of IRPT in Bangladesh is also very slow and sluggish (14 quarters for lending rate) in all lending, deposit and money market channels. The overall paled facet of IRPT in Bangladesh may be due to the inefficiency of the financial market and the non-reliance of BB on interest rate measures for conducting and implementation of its monetary policy. The lower pass-through to the lending and deposit channel lead to a higher interest rate spread for the country's banking industry and policy rate has almost no influence on real sector of the economy. It also means that interest rate tool is no longer effective for stabilising the fluctuation of the business cycle of the economy. This may degraded the effectiveness of the monetary policy stance and ultimately lead to lower banking competition. Further, credit channeling to thirsty sectors of the economy by using interest rate elasticity is also not possible in such circumstances. So, the low interest rate pass-through is a clear challenge for monetary policy implementation and it may be responsible for the higher the risk premium of financial intermediaries as well. Finally, policy rates are not the sole source of ramifications for Call Money, Lending and Deposit rates. A large number of macro and microeconomic variables can have influence on these rates which are not considered in this paper.

**Appendix 1:**

**RM, BM, MM and V of Bangladesh Economy**

Taka in Crore

| Year    | NDA      | NFA      | RM       | Balances of scheduled banks with BB | CIC     | Time Deposit (TD) | Demand Deposit(DD) | BM= CIC+TD+DD | mm=BM/RM | V= PY/M2 |
|---------|----------|----------|----------|-------------------------------------|---------|-------------------|--------------------|---------------|----------|----------|
|         | 1        | 2        | 1+2+4=3  | 4                                   | 5       | 6                 | 7                  | 5+6+7=8       | mm= 8/3  |          |
| 1989-90 | 5190.3   | 1025.5   | 6215.8   | 2265.0                              | 3860.5  | 17800.7           | 3591.9             | 21114.4       | 3.4      | 4.5      |
| 1990-91 | 5363.5   | 1137.2   | 6500.7   | 2150.8                              | 4235.7  | 20268.7           | 4184.6             | 25004.4       | 3.8      | 4.4      |
| 1991-92 | 3435.5   | 3386.6   | 6822.1   | 3925.8                              | 4671.3  | 22473             | 4582.5             | 28525.9       | 4.2      | 4.2      |
| 1992-93 | 3281.9   | 5662.9   | 8944.8   | 5200.4                              | 5019.0  | 25235.9           | 5751.1             | 31535.6       | 3.5      | 4.0      |
| 1993-94 | 3057.1   | 8250.8   | 11307.9  | 3441.5                              | 6107.5  | 29088.5           | 6614.3             | 36403.0       | 3.2      | 3.7      |
| 1994-95 | 1765.9   | 8864.1   | 10630.0  | 3103.7                              | 7188.5  | 31300.6           | 7336.1             | 42267.9       | 4.0      | 3.6      |
| 1995-96 | 5614.3   | 5388.7   | 11003.0  | 3939.8                              | 7899.3  | 35544.0           | 7735.2             | 45690.5       | 4.2      | 3.6      |
| 1996-97 | 7382.4   | 5012.1   | 12394.5  | 3017.8                              | 8454.7  | 41699.3           | 8928.2             | 50627.5       | 4.1      | 3.6      |
| 1997-98 | 8312.5   | 5305.1   | 13617.6  | 3655.9                              | 9076.6  | 46812.2           | 9056.9             | 55869.1       | 4.1      | 3.6      |
| 1998-99 | 10125.5  | 4617.2   | 14742.7  | 3812.5                              | 9713.5  | 53095.4           | 9931.7             | 63027.1       | 4.3      | 3.5      |
| 1999-00 | 11398.0  | 5666.1   | 17064.1  | 4183.4                              | 11264.4 | 63528.0           | 11234.4            | 74762.4       | 4.4      | 3.2      |
| 2000-01 | 14115.0  | 4812.4   | 18927.4  | 3385.7                              | 12832.8 | 74656.9           | 12517.3            | 87174.2       | 4.6      | 2.9      |
| 2001-02 | 13342.6  | 7230.4   | 20573.0  | 6692.8                              | 13880.2 | 85302.6           | 13313.4            | 98616.0       | 4.8      | 2.8      |
| 2002-03 | 9631.8   | 11809.7  | 21441.5  | 6099.2                              | 15342.3 | 99382.9           | 14611.6            | 113994.5      | 5.3      | 2.6      |
| 2003-04 | 10328.1  | 13542.3  | 23870.4  | 6583.0                              | 17287.4 | 113076.8          | 16644.4            | 129721.2      | 5.4      | 2.6      |
| 2004-05 | 12722.2  | 14678.2  | 27400.4  | 7072.5                              | 20327.9 | 132243.9          | 19202.5            | 151446.4      | 5.5      | 2.5      |
| 2005-06 | 15314.4  | 18640.3  | 33954.7  | 9060.6                              | 24894.1 | 158067.8          | 22606.5            | 180674.3      | 5.3      | 2.3      |
| 2006-07 | 10664.3  | 28758.4  | 39422.7  | 10635.3                             | 28787.4 | 184651.3          | 26853.1            | 211504.4      | 5.4      | 2.2      |
| 2007-08 | 14748.3  | 32813.8  | 47562.1  | 11913.6                             | 35648.5 | 218250.8          | 30544.0            | 248794.8      | 5.2      | 2.2      |
| 2008-09 | 19521.9  | 43227.5  | 62749.4  | 23300.7                             | 39448.7 | 262059.5          | 34440.2            | 296499.7      | 4.7      | 2.1      |
| 2009-10 | 12961.8  | 61181.0  | 74142.8  | 23677.4                             | 50465.4 | 315315.1          | 47716.1            | 363031.2      | 4.9      | 1.9      |
| 2010-11 | 28392.3  | 61342.1  | 89734.4  | 29207.5                             | 60526.9 | 385551.4          | 54968.5            | 440519.9      | 4.9      | 1.8      |
| 2011-12 | 28872.6  | 68930.1  | 97802.7  | 32906.2                             | 64896.5 | 459515.6          | 57593.9            | 517109.5      | 5.3      | 1.8      |
| 2012-13 | 9243.4   | 103246.0 | 112489.4 | 37117.1                             | 75372.3 | 540707.1          | 62798.5            | 603505.6      | 5.4      | 2.0      |
| 2013-14 | -17621.3 | 147496.6 | 129875.3 | 44390.1                             | 85485.2 | 628299.6          | 72323.9            | 700623.5      | 5.4      | 1.9      |
| 2014-15 | -28918.8 | 177401.3 | 148482.5 | 50328.6                             | 98153.9 | 706075.5          | 81538.6            | 787614.1      | 5.3      | 1.9      |

## Appendix 2

### NDA and its components of Bangladesh bank

| Year    | Components of NDA |        |        |         |              | NDA         |
|---------|-------------------|--------|--------|---------|--------------|-------------|
|         | GNB               | CONFP  | Pvt.   | CDMB    | Others (Net) |             |
|         | 1                 | 2      | 3      | 4       | 5            | 1+...+4 = 6 |
| 1989-90 | 1489.2            | 870.5  | 0      | 4109.4  | -1085.6      | 6468.7      |
| 1990-91 | 1677.7            | 932.6  | 0      | 3939    | -1185.8      | 5363.5      |
| 1991-92 | 1196.9            | 902.6  | 0      | 3373    | -2037        | 3435.5      |
| 1992-93 | 1447.8            | 882.6  | 0      | 2897.2  | -1945.7      | 3281.9      |
| 1993-94 | 1009.6            | 1635.9 | 0      | 2576.7  | -2073.4      | 3148.8      |
| 1994-95 | 1254.0            | 1056.8 | 15.7   | 2733.8  | -3202.7      | 1857.6      |
| 1995-96 | 3036.8            | 1195.5 | 15.7   | 3413.7  | -1955.7      | 5706.0      |
| 1996-97 | 4488.9            | 1192.6 | 15.7   | 3600.3  | -1823.4      | 7474.1      |
| 1997-98 | 5295.5            | 1404.8 | 15.7   | 3749.4  | -2152.9      | 8312.5      |
| 1998-99 | 6359.9            | 1365.6 | 808.4  | 4622.8  | -3031.2      | 10125.5     |
| 1999-00 | 8098.0            | 1320.7 | 900.4  | 4289.2  | -3210.3      | 11398.0     |
| 2000-01 | 10107.3           | 1305.1 | 987.5  | 4368.6  | -2653.5      | 14115.0     |
| 2001-02 | 12834.3           | 1277.6 | 1008.1 | 4729.3  | -6506.7      | 13342.6     |
| 2002-03 | 7353.3            | 1281.9 | 1141.7 | 4846.8  | -4991.9      | 9631.8      |
| 2003-04 | 11847.6           | 1241.1 | 1241.3 | 5852.1  | -9854        | 10328.1     |
| 2004-05 | 15674.3           | 1105.6 | 1341.4 | 6132.5  | -11531.6     | 12722.2     |
| 2005-06 | 25026.1           | 1016   | 1429.9 | 6346.3  | -18503.9     | 15314.4     |
| 2006-07 | 25931.1           | 988    | 1576.1 | 6442.1  | -24273       | 10664.3     |
| 2007-08 | 25997.3           | 946.4  | 1696.8 | 7334.2  | -21226.4     | 14748.3     |
| 2008-09 | 28955.4           | 853.1  | 2022.1 | 6846.8  | -19155.5     | 19521.9     |
| 2009-10 | 22320.6           | 830.7  | 2588.7 | 6613.9  | -19392.1     | 12961.8     |
| 2010-11 | 32049.7           | 776.7  | 3143.7 | 18608.8 | -26186.6     | 28392.3     |
| 2011-12 | 38044.0           | 1181.9 | 3598.7 | 22627.4 | -36579.4     | 28872.6     |
| 2012-13 | 27069.0           | 1354.5 | 4180.2 | 10219   | -33579.3     | 9243.4      |
| 2013-14 | 3840.6            | 1202.7 | 4272.7 | 6279.2  | -33216.5     | -17621.3    |
| 2014-15 | 810.5             | 2160.8 | 4645.6 | 5659.2  | -42194.9     | -28918.8    |

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## **Integrated Marketing Strategy and Development of Tourism Sectors: A Case of Bangladesh**

**Shishir Reza \***

### ***Abstract***

*Tourism is considered one of the largest and rapid growing economic sectors in the corporate world. It is one of the fastest and dynamic international industry sectors. Many countries like Malaysia, Cambodia, Vietnam, Kenya, SriLanka, South Africa, and Peru have developed their economy through proper utilization and management of tourism sector. Like many other developing countries, Bangladesh has enormous potential to improve tourism sector and related economy. In Bangladesh, we have not only the longest sandy sea beach Cox'sBazar and the largest single tract of mangrove forest Sundarbans but also many other natural, cultural, religious and historical sites which have huge potentials to be unique selling points for us. Due to lack of effective policies and their implementation, proper marketing strategy and promotion, Bangladesh has not seen a huge tourist's crowd as expected. Tourism sector can set up a sustainable economic trend in Bangladesh if philosophy of proper marketing strategy formation and implementation can be established. Considering the importance of tourism sector, integrated marketing strategy can play a vital role. Through integrated marketing strategy, our tourist spots can be focused in a clear, consistent and persuasive way to the whole world.*

**Keywords:** Tourism, Beautiful Bangladesh, Integrated Marketing Strategy

**JEL Classification:**

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## Introduction:

It is not a matter of concern that, Bangladesh is a poor, corrupted, flood-ravaged and more of a disaster zone than a travel destination. But behind these figures our country is enriched with beautiful and interesting attractions. Bangladesh is a country with rich traditions, natural beauty, beaches, forests, lakes, hills, wild lives, archaeological attractions, monuments, handicrafts, sanctuaries, religious festivals, cultural heritage, tribal culture and architecture, incredible greenery, mighty rivers and attractive river cruises, sunny beaches, colorful tribal life and attractive cultural functions that offer great tourist attractions. It is true that tourism contributes 10% GDP of the world's economy (Kimura, H.2011). Bangladesh Economic Review (2010) states that Bangladesh has basically three sectors of generating revenue: industry, agriculture and service. Tourism is a part of service sector which contributes to the GDP of Bangladesh. Though the contribution of tourism in GDP is only 7% in 2004-05, it has increased to 9.44% by the year 2009-10. Due to the political instability, it decreases in 2014 which is 4.1% of total GDP and in 2015; tourism contributes 4.7% of the total GDP. Basically, effective promotional strategies are very essential for the improvement of tourism industry in any country. Due to lack of available research, fund and proper marketing strategy, Bangladesh Parjaton Corporation could not yet develop the promotional strategies. As a result, tourism industry could not get room to grow correctly in Bangladesh. But there are lot of opportunities if Bangladesh attempts to focus our land as a tourist destination to the tourists through an effective promotional policies and can take some steps to improve some infrastructural facilities, the country would be able to earn more than present. It is known to all that, Bangladesh tourism industry could not achieve the remarkable progress in comparison to other South Asia. Limited promotional materials like souvenirs, brochures, travel guides, accommodation guides, hand books, tourist maps, poster, folders are distributed by Parjaton Corporation and some other private tour operators don't reach properly to the potential tourists and in addition to that, the quality of these materials is not satisfactory which causes not to create adequate curiosity among the potential tourists. Considering the time factor and limitation of other resources, only the promotional aspects has been considered for the present study and it will be attempted to examine the existing promotional approaches of both the public and private sector tour operators, identify the problems and the limitations of their promotional activities, and prescribe necessary policy measures for effective promotional actions for the industry in Bangladesh. The report has focused on the different aspects of tourism and ways to promote this lucrative sector of economy.

**Methodology of the Study:** It is an exploratory type of study. Data has collected from both primary and secondary sources. Secondary source includes different journals and articles, different textbooks, news papers, different websites. The relevant data has collected by informal discussion with the experts and by formal survey. The target people were officials of Parjaton Corporation and the tourists from home and abroad. Sampling technique was judgmental sampling and Sample sizes are 20 respondents from the officials and 40 respondents from the tourists.

### **Tourism: Meaning and Types**

The definition of tourism used by World Tourism Organization is as follows which was quoted by Middleton in 1994:

"Tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year of leisure, business and other purpose."

Tourism can be classified in a number of ways based on the nature of activity, location type or duration of stay. A brief description on major types of tourism can be presented as:

**Heritage Tourism:** The most hottest or recent trend in today's tourism industry is heritage tourism or visiting historical sites of an area. Nowadays, people want to enrich their lives through travelling not to escape rather than visiting a park or a mountain range. They want to experience unique places, traditions and history and learn about their cultural roots. Heritage tourism involves visiting historical sites that may include old canals, railways, battleground etc. with the purpose of gaining an appreciation of the past.

**Adventure Tourism:** Adventure tourism is defined as: "A trip or travel with the specific purpose of activity participation to explore a new experience, often involving perceived risk or controlled danger associated with personal challenges, in a natural environment or exotic outdoor setting". It is rapidly growing in popularity as tourists seek unusual holidays, different from the typical beach vacation and typically involves travelling into remote, inaccessible and possibly hostile areas. It may include the performance of acts that require significant effort and grit and may also involve some degree of risk.

**Ecotourism:** Ecotourism refers to tourism that is based on the natural environment but that seeks to minimize the harmful impacts. It focuses on local cultures, wilderness adventures, volunteering, personal growth and learning new ways to live on our vulnerable planet. Responsible ecotourism includes programs that minimize the adverse

effects of traditional tourism on the natural environment, and enhance the cultural integrity of local people.

**Cultural Tourism:** Cultural tourism is the subset of tourism concerned with a country or region's culture, especially its arts and includes tourism in urban areas, particularly historic or large cities and their cultural facilities such as museums and theatres. Cultural tourism has begun to be recognized as a tourism product category with potential, rather than a niche and specialized activity and cited that between 35 and 70 percent of international travelers are now considered cultural tourists.

**Agri-tourism:** A style of vacation in which hospitality is offered on farms which may include the opportunity to assist with farming tasks during the visit where the tourists have the opportunity to pick up fruits and vegetables, ride horses, taste honey, learn about wine, shop in gift shops and farms stands for local and regional produce or hand-crafted gifts, and much more. Each farm generally offers a unique and memorable experience suitable for the entire family. People are more interested in how their food is produced and want to meet the producers and talk with them about what goes into food production.

### **Economic Importance of Tourism with Special Reference to Bangladesh:**

Tourism ensures the viability of economy, sensitivity of ecology and appropriateness of culture. It is a sustainable form of natural environment based trend that combines environment and economy and seeks to minimize harmful impacts, focuses on local culture, wilderness adventures, volunteering, personal growth as well as learning new ways to live on our vulnerable planet. Tourism is considered as the single largest industry in the world and both the developed and developing countries have started to realize the economic importance of this sector and striving to maximizing the benefit from this sector as much as possible. Bangladesh tourism industry with its enormous potentials is striving to reach at a satisfactory level in order to play the expected role in the economy of the country. The importance of tourism can be considered as a major source of revenue and can play an important role in the economic development of Bangladesh. According to the World Tourism Organization, a total number of 763.25 million international tourist traffics were recorded during 2004 and received US\$ 622.68 billion from this sector (WTO, 2005) and making the tourism as one of the largest industries in the world. Tourism business is essential to economy because of the direct effect on employment, the balance of payment and society in terms of educational and cultural benefits (Gilbert, 1989). Tourism's appeal to developing countries is based, in large part, on its provision of foreign currency earnings and corresponding alleviation of the balance of payments constraint. As Bangladesh is facing the constraints in foreign currency as

well as the adverse position in the balance of payment account, the proper policy and strategy for the development of tourism industry can contribute positively to overcome the situation. Tourism not only helps the national development but also contribute to regional development. As a result, tourism is increasingly seen as a catalyst for regional development, and a number of studies and projects have investigated how tourism could support development in peripheral regions. Tourism helps in the process of generating foreign exchange, creation of employment and encouragement of local economy especially nature tourism which occurs in rural areas, it can lead to localized economic development in these often neglected areas. Tourism industry has a great importance not only as a generator of income but also for creating employment opportunities. Tourism which is now most often considered as the more labor-incentive sector than any other industry and has emerged as the world's largest generator of jobs. Tourism is a labor-incentive industry provides the scope of creating direct and indirect employment opportunities for a large number of skilled and unskilled persons. Tourism not only facilitates the creation of jobs but also contributes to the distribution of wealth among regions of different income. A long-term strategy for the development of the tourism sector of Bangladesh can uplift the sector to contribute to promote the tourism related services like hotel services; transport services and other related business which will intern generate the employment opportunities in the country. Tourism has a noticeable impact on the balance of payments of many countries. If Bangladesh can utilize the full potential of its tourism then it will help to earn a large amount of foreign currency from this industry which can be utilized to fulfill the unfavorable gap of the country's balance of payment account.

### **Tourism Sector in Bangladesh: Current Status**

Bangladesh is a country filled with natural wonders and untouched reserves and home to a variety of unique and magnificent creatures. She has many tourist attractions including archaeological sites, historic mosques and monuments, resorts, beaches, forest and wildlife. Many foreigners still know Bangladesh as a country of poverty, beggars, floods, and political unrest. Some more negative aspects including sanitation problems, uncomfortable ground level transports, insufficient accommodations at the destination areas, insecurity of movements, lack of pure drinking water and hygienic food, etc. have also affected the image of the country as a tourist destination. But the people who have visited Bangladesh are pleased with and satisfied with the country's magnificent natural beauty, eye-catching attractions, rich cultural heritage, cheap services and facilities, and friendly simple people. Bangladesh has enormous beauty, hundreds of serpentine rivers, lakes of crystal clear water, ever green hills, luxuriant tropical rain forests, beautiful

green tea gardens, Sundarban- the world's largest mangrove forest, home of the Royal Bengal Tiger and the wild lives, Hill Tracts tribal people, warbling of birds in green trees, wind in the paddy fields, plenty of sunshine, world's longest and unbroken natural sea beach in Cox's Bazar, Kuakata sea beach- a beach offering a full view of both the sunrise and sunset, rich cultural heritage, relics of ancient Buddhist civilizations and colorful tribal lives, an old and eventful historic place and home of an ancient civilization - Bangladesh creates an unforgettable impression of a land of peace. These could be reasons why Bangladesh should be highlighted in the world's tourist maps. Regarding the above facts, Parjaton Corporation along with other private tour operators should prioritize the issue of correcting the image of our motherland by undertaking diversified measures in order to develop tourism in Bangladesh. The government should also extend the cooperation in this regard by playing the major role in building the positive image so that this industry can play key role to the economy of the country.

### Tourist Arrivals in Bangladesh

The following table shows the tourist arrivals in Bangladesh in different years:

| Month     | 2006    | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    | 2014    | 2015    |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| January   | 20,213  | 16,733  | 39,345  | 29,632  | 24,670  | 20,370  | 19,170  | 16,733  | 10,045  | 27,202  |
| February  | 15,848  | 17,308  | 30,788  | 27,286  | 26,012  | 22,021  | 22,022  | 15,308  | 15,288  | 25,181  |
| March     | 19,853  | 17,579  | 30,079  | 27,114  | 25,262  | 25,999  | 21,202  | 16,579  | 14,079  | 24,014  |
| April     | 16,234  | 23,956  | 25,128  | 28,786  | 25,173  | 21,455  | 20,211  | 14,956  | 13,128  | 25,281  |
| May       | 18,535  | 20,853  | 36,929  | 25,704  | 19,959  | 15,213  | 17,100  | 14,853  | 16,220  | 22,104  |
| June      | 17,496  | 24,483  | 39,158  | 26,244  | 24,020  | 19,623  | 15,201  | 17,483  | 15,158  | 20,200  |
| July      | 19,773  | 32,223  | 42,457  | 25,780  | 25,991  | 21,423  | 16,233  | 27,223  | 14,411  | 21,283  |
| August    | 15,292  | 20,614  | 36,017  | 20,239  | 23,938  | 17,762  | 20,102  | 20,614  | 16,017  | 17,130  |
| September | 13,166  | 18,509  | 26,723  | 19,749  | 20,860  | 18,336  | 14,206  | 18,509  | 17,321  | 16,742  |
| October   | 15,568  | 27,073  | 43,213  | 18,963  | 22,785  | 20,112  | 18,312  | 19,073  | 21,203  | 18,903  |
| November  | 18,399  | 30,308  | 39,996  | 21,336  | 25,208  | 23,322  | 21,312  | 14,308  | 21,196  | 19,336  |
| December  | 17,285  | 39,471  | 77,499  | 25,274  | 20,392  | 22,122  | 19,202  | 19,471  | 29,409  | 21,274  |
| Total     | 207,662 | 289,110 | 467,332 | 297,107 | 271,270 | 247,788 | 224,273 | 215,113 | 203,475 | 258,650 |

**Table: Foreign Visitors Arrival by Months (2006-2015)**

(Source: Bangladesh Tourism Board and World Travel and Tourism, 2016)

The table shows that the number of tourist arrivals in Bangladesh has increased to 271,270 in 2010 from 207,662 in 2006. In general, the statistics shows a very good and positive trend. But the fact is that the overall scenario is not good. Due to the political instability and strike, the rate of tourist's arrival had decreased from the year of 2011. At the initial level of market entry, the above arrival rate is not a positive one. Expected tourists' arrival is about 600,000 for the year 2020, subject to remaining the present trend unchanged. Keeping gap between marketing strategy formation and implementation, it is impossible to fulfill the target.

### Foreign Exchange Earnings from Tourism and Travels in Bangladesh

The marketing performance of any tourism organization can be evaluated based on the earnings by the organization. The following table shows the earnings and growth rate of the same of BPC, the only government owned tourism organization in Bangladesh :( Million Taka)

| Month        | 2001           | 2002           | 2003           | 2004           | 2005           | 2006           | 2007           | 2008           | 2009           | 2010           |
|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Jan          | 273.80         | 297.50         | 259.00         | 457.00         | 450.42         | 653.71         | 561.13         | 749.28         | 649.24         | 495.98         |
| Feb          | 218.10         | 260.60         | 327.00         | 393.70         | 502.73         | 554.11         | 624.04         | 585.06         | 579.46         | 496.98         |
| Mar          | 196.10         | 336.20         | 355.90         | 425.90         | 468.50         | 538.94         | 471.90         | 527.79         | 518.90         | 565.97         |
| Apr          | 219.00         | 312.50         | 241.10         | 309.40         | 335.56         | 411.62         | 387.22         | 459.35         | 473.85         | 427.37         |
| May          | 240.50         | 282.70         | 226.30         | 305.00         | 347.95         | 452.02         | 449.95         | 423.06         | 538.21         | 342.11         |
| Jun          | 221.70         | 313.00         | 288.00         | 279.70         | 301.23         | 394.96         | 366.17         | 509.52         | 417.71         | 473.03         |
| Jul          | 207.10         | 267.50         | 302.30         | 303.60         | 296.98         | 398.14         | 346.63         | 461.98         | 453.03         | 320.97         |
| Aug          | 170.50         | 251.50         | 232.00         | 285.90         | 354.61         | 424.16         | 363.72         | 417.30         | 439.32         | 431.37         |
| Sep          | 193.40         | 245.90         | 217.30         | 293.10         | 334.14         | 362.29         | 342.54         | 464.46         | 350.65         | 368.06         |
| Oct          | 187.00         | 205.00         | 265.10         | 247.90         | 332.67         | 327.95         | 359.68         | 415.67         | 361.99         | 525.26         |
| Nov          | 234.80         | 277.70         | 224.20         | 250.42         | 324.45         | 444.50         | 440.25         | 519.39         | 461.28         | 477.14         |
| Dec          | 291.80         | 262.50         | 371.80         | 415.94         | 444.65         | 568.25         | 551.96         | 591.66         | 518.60         | 638.46         |
| <b>Total</b> | <b>2653.80</b> | <b>3312.60</b> | <b>3310.00</b> | <b>3967.56</b> | <b>4493.89</b> | <b>5530.65</b> | <b>5265.19</b> | <b>6124.52</b> | <b>5762.24</b> | <b>5562.70</b> |
| % Change     | 1.02           | 24.82          | -0.08          | 19.87          | 13.27          | 23.07          | -4.80          | 16.32          | -5.92          | -3.46          |

**Table: Foreign Exchange Earnings from Tourism & Other Travels (2001-2010)**

(Source: Bangladesh Tourism Board, 2016)

Though the foreign exchange earnings through mobilizing domestic resources by the host country's tourism industry can play an important role in the economy, the earning of Parjaton Corporation is very insignificant in terms of the overall earnings of the said

industry in the world and even in the Asian region. The earnings from tourism in Bangladesh were Tk. 267.7 million in 1990-91 which increased to Tk. 5562.70 million in 2010. There is also a very positive sign that in most of the year from 2000 to 2010 has a positive growth rate. From the above table we have seen, Bangladesh does not have a good position in world tourism, but the trend of growth rate in the earnings is encouraging.

### **Tourist Spots in Bangladesh:**

Bangladesh is a country adorned by the beauty of the nature. It has many beautiful places to present to the tourists like sea beaches, forests, lakes, hills, wild lives, archaeological attractions, monuments etc.

**1. Sea Beaches:** Cox's Bazar, the longest sea beach of the world, is the tourist capital of Bangladesh. The shark-free beach is good for bathing, sun-bathing and swimming. The breathtaking beauty of the setting sun behind the waves of the sea is captivating. Visits to the fascinating spot like Himchhari, Teknaf, Inani Beach, Buddhist Temple at Ramu and islands such as Sonadia, St. Martin and Moheskhalia can form memorable experiences of one's lifetime. Kuakata is a panoramic sea beach on the southern most tip of Bangladesh. Located in the Patuakhali district, Kuakata has a wide sandy beach from where one can observe both the sunrise and sunset. The Kuakata beach is 30 km long and 6 km wide.

**2. Archaeological Sites:** About eight km. to the west of Comilla town which is situated 144 km. south east of Dhaka lays a range of low hills known as Mainamati-Lalmai ridge, an extensive centre of Buddhist culture. On the slopes of these hills lie scattered a treasure of information about the early Buddhist civilization. Paharpur is the most important and the largest known monastery, help to recollect the glorious past of the then Bengal under the Pala dynasty of 8th century A.D. and had been declared as a World Heritage Site by UNESCO. Mahasthangarh, The oldest archaeological site of Bangladesh situated at a distance of 18 km to the North Bogra town and is famous for its size and height of the tower and pavilion. It is an archaeological site of the 3rd century B.C. and till today held to be of immense holiness by the Hindus.

**3. Monuments:** The National Memorial located at Savar, Dhaka, dedicated to the sacred memory of millions of unknown martyrs of liberation war of 1971 that brought Bangladesh into being an independent country. The Central Shahid Minar bears the symbol of Bengali nationalism and is dedicated to the honour of martyrs of the historical language movement of 1952 to establish the right of Bengali as the state language. War Cemetery is located in Chittagong where over 700 soldiers buried from Commonwealth countries and Japan, who died during the Second World War.

**4. Museums:** The National Museum was established in 1913 and which has four main departments, namely: National History, History and Cultural art, Ethnography and Decorative art and Contemporary art and Civilization. Each department is enriched with rare collections. Folk Art Museum was established in 1975 to fulfill the dream of the famous painter Shilpacharya Zainul Abedin with a rich collection of different folk objects of aesthetic and utilitarian values reflecting the temperaments, skills and expertise's of the artists and artisans who made them. Shilaidaha Kuthibari carries memories of Nobel Laureate poet Rabindranath Tagore and preserves many of his short stories songs and poem in this house, and some special and rare attractions like: Rabindranath Tagore's photographs of childhood, youth and old age are exhibited here. Some paintings painted by Tagore display here. Varendra Research Museum has a rich collection of objects from Mohenjodaro and also from 16th to 19th centuries with a rich collection of interesting objects of Hindu, Buddhist and Muslim heritage.

**5. Forests:** The Sundarbans is the largest mangrove forest in the world. Two-third of the Sundarbans is in Bangladesh. Sundarbans South, East and West are three protected forests in Bangladesh. This region is densely covered by mangrove forests, and is one of the largest reserves for the Bengal tiger. National Botanical Garden was established in 1961 and is located to the eastern side of National Zoological Garden in Mirpur with a total area of 84 hectare of land. The garden has a collection of about 100 species of local and foreign plants. About 100 varieties of roses, in the bamboo grove 100 varieties of bamboo, varieties of sandal wood are some notable attractions of the garden along with about 60 species of different rare and exotic plants. Botanical Garden and Eco-park is a reserved forest block with unique natural beauty established in 1998 at the foothill of Chandranath Hill at Sitakunda, Chittagong with a total area of 808 hectare. It is a promising site for developing habitat of wild flora and fauna, blooming eco-tourism and developing research and education for scientists of home and abroad.

**6. Hills, Rivers, Lakes and Island:** Rangamati is a wonderful repository of scenic splendors with flora and fauna of varied descriptions. The township is located on the western bank of the Kaptai Lake. Rangamati is a favorite holiday resort because of its beautiful landscape, scenic beauty, lake, colorful tribes, its flora and fauna, tribal museum, hanging bridge, homespun textile products, ivory jewellery and the tribal men and women who fashion them. Bandarban is regarded as one of the most attractive travel destinations in Bangladesh. Its resources can attract tourists from all over the country or even from abroad. Nilgiri is a famous tourist place here. Notably Bandarban is the house of the three highest peaks of Bangladesh. Khagrachari is also known as Phalang Htaung or the Mong Circle. Khagrachari is a valley. It has three rivers namely Chengi, Kasalong

and Maini. Most of the land of Khagrachari is hilly areas. Its resources can attract tourists from all over the country or even from abroad. The Sylhet Division is covered with terraced tea estates, patches of tropical rainforest, pineapple plantations and orange groves. This division has the best climate in the country - temperate and cool air in the winter and moderately warm in the summer. This place is also of religious importance to the pious Muslims of Bangladesh since the shrines of Hazrat Shahjalal (RA) and Hazrat Shahporan (RA) are situated there. St. Martin's Island is the only coral island in Bangladesh. It is about 8 km west of the northwest coast of Myanmar at the mouth of the Naf River. The local name of the island is "Narical Gingira". Saint Martin's Island has become a popular tourist spot.

### Findings and Analysis of the Study:

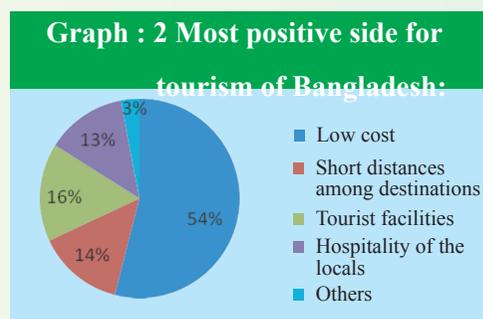
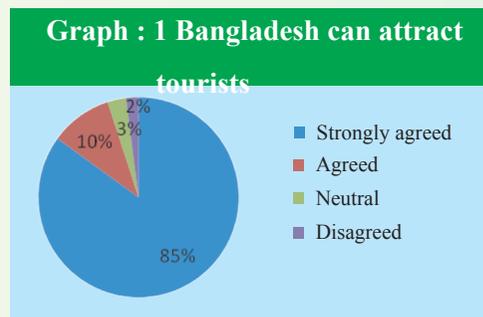
This evaluation may help to find out whether the promotion activities have any role or not in tourism marketing, are the tour operators are spending the sufficient amount on promotional activities or not, whether they need to spend more money to promotion or not and finally, is the promotional measures undertaken and launched by the same industry is effective or not. The objectives of tourism industry must match with the findings delineated in the whole report. To have insights about the industry a survey was conducted on 40 persons of varying age, social class, income level. This survey has supported to understand the present condition of our tourism industry. Followings are some of the findings of my survey;

#### 1. Bangladesh Can Attract More Tourists:

The respondents were asked whether Bangladesh can attract more tourists in future. 95% of the respondents think that Bangladesh has a great opportunity of attracting more tourists in the future. Only 5% of them have negative impression about the prospect of attracting more tourists. (Graph: 1)

#### 2. Most positive side for tourism of Bangladesh:

The respondents were asked to name the most positive side for tourism in Bangladesh. 54% mentioned low cost as the most positive side for tourism of



Bangladesh. Some other positive sides for tourism of Bangladesh as mentioned by the respondents are short distances among destinations, facilities, hospitality of locals etc. (Graph: 2)

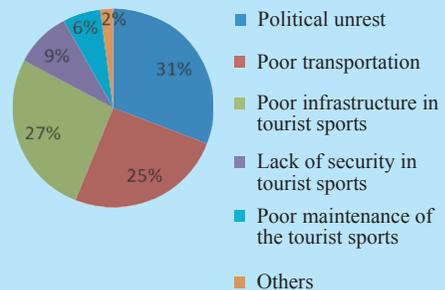
**3. Most Negative Side for Tourism of Bangladesh:** The respondents were asked to name the most negative side for tourism in Bangladesh. 31% of the respondents mentioned political unrest as the most negative side. Some other negative sides for tourism in Bangladesh are poor transportation, poor infrastructure, lack of security for tourists, poor maintenance of the tourist's spots etc.(Graph:3)

**4. Most Preferable Spots:** The respondents were asked to list their most preferable spots. 63% of them name Cox's Bazar as their most preferable spots. Other preferable spots are the Sundarbans, Chittagong Hill Tracts, Sylhet, Kuakata etc. (Graph: 4)

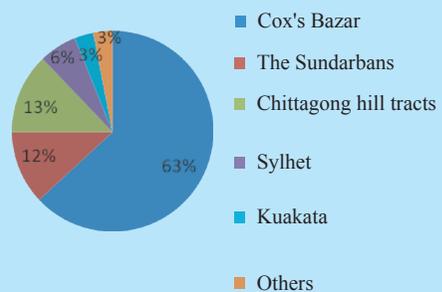
**5. Government Steps are Adequate:** The respondents were asked whether government steps for the development of tourism in Bangladesh are sufficient or not. 52% of the respondents think that the government steps were not adequate. Only a small portion of the respondents was satisfied with the initiatives of the government.(Graph: 5)

**6. Advertising can play the key role:** The respondents were asked which promotional tools can be used to promote tourism in Bangladesh. 25% of them think that

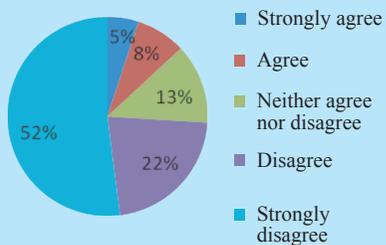
**Graph : 3. Most Negative Side for Tourism of Bangladesh:**



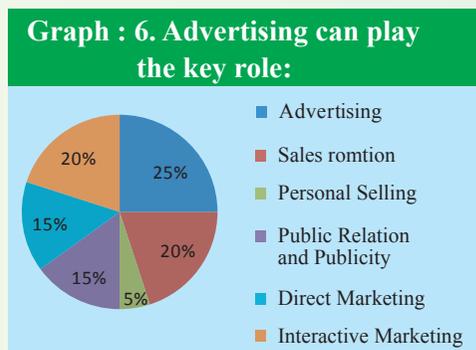
**Graph : 4. Most Preferable Spots:**



**Graph : 5. Government Steps are Adequate:**



advertising can play very important role. 20% of them think Sales promotion should be used; another 20% think Interactive marketing can be effective. 15% emphasize Public relation and publicity, another 15% emphasize Direct Marketing. Only 5% respondents mentioned personal selling to be used as a promotional tool to promote tourism.(Graph: 6)



Besides, the tourism industry is still quite young in Bangladesh and its development has been predominantly left to the local market forces. The climatic changes throughout the year have considerable implications for travelling in Bangladesh since the country occasionally experiences harsh storms, floods and earthquakes. The country also has a worldwide image of poor land with numerous natural catastrophes and corruption. The national tourism sector is negatively affected by the lack of social and political commitment.

### **Role of Integrated Marketing Strategy to Promote Tourism in Bangladesh**

Various tools of Marketing Communication Strategy can be used to promote the tourism sector of Bangladesh.

**Advertising:** Advertising is a non-personal form of mass communication and offers a high degree of control for those responsible for the design and delivery of the advertising message. Different tourist attraction of the country can be advertised in TV, Radio, newspaper, Journals or magazines using persuasive message to attract the potential visitors. Both the home country media and foreign media can be used to deliver the message. For example: Some persuasive and attractive advertisements like "Beautiful Bangladesh" can be prepared and presented in broadcast media.

**Sales promotion:** According to Philip Kotler, sales promotion is the short-term incentives to encourage the purchase or sale of a product or service. According to the authors, samples, cash refunds, price packs, premiums, advertising specialties, patronage rewards, point-of-purchase displays and demonstrations, and contests, sweepstakes and games can be used for consumer promotion tools and many of the tools used for consumer promotions- contests, premiums, displays - can be used as trade promotions or alternatively, the manufacturer may offer a straight discount off the list price on each case purchased during a stated period of time, also called a price-off, off-invoice or off-

list whereas in business promotion includes many of the same tools used for consumer or trade promotions but mainly conventions and trade shows and sales contests are used for business promotions. Incentives can be given to attract the visitors in the off-season. For example- tour package, discount services, price reduction or some facilities can be offered to the visitors. Some lucrative offers can be offered on different occasions. Tour fair can also be arranged. Again, special offers can be given on special days like Valentine's Day, or any other days when there exists an opportunity to attract visitors.

**Personal selling:** Personal selling is traditionally perceived as a communication tool which involves face-to-face activities undertaken by individuals, often representing an organization, in order to inform, persuade or remind an individual or group to take appropriate action, as required by the sponsor's representative. According to the author, a sales person engages in communication in a one-to-one basis where instantaneous feedback is possible and the costs associated with interpersonal communication are normally very large. The respective authority can send their delegates to different countries where they will personally deliver messages about the tourist's attraction and facilities of our country in different seminars and meetings. 'Team selling' form of personal selling can be used where groups of people will present information on our tourists spot to a number of potential visitors who can influence even more visitors to visit our tourists spots.

**Public relations:** Public relations is the art and social science of analyzing trends, predicting their consequences, counseling organization's leadership, and implementing planned programs of action which will serve both the organization's and the public interest. Third-party like magazines, newspapers, news programs etc. disseminate the messages on behalf of a particular company or organization. The increasing use of public relations and in particular publicity is a reflection of the high credibility attached to this form of communication and there is no charge for the media space or time but there are costs incurred in the production of the material. Press relations, product publicity, corporate communications, lobbying and counseling etc. are the different tools which can be used for public relation effectively. Bangladesh can establish one tourism promotion office and help desk in each of the countries where a large number of visitors are supposed to be found. Again, a Tourism booth can open in each of the High Commissioner Offices of Bangladesh in various countries.

**Direct Marketing:** Direct Marketing is defined as any activity which creates and profitably exploits a direct relationship between the company and its prospect. Direct marketing is a term used to refer to all media activities that generate a series of

communications and responses with an existing or potential customer. Telephone, mail, fax, e-mail, the Internet etc. can be used to communicate directly with specific consumers and to create and sustain a personal and intermediary-free dialogue with them. The database from the travel agencies and hotels can be used to obtain the lists of their frequent clients. This information can be used to communicate and inform about various tour facilities and offers to the potential client bases. For example, it may take the form of direct-mail marketing, catalog marketing, telephone marketing or direct-response television marketing.

**Interactive Marketing:** Interactive marketing relies on customers expressing their preferences so that marketers can produce more relevant marketing messages. Unlike the outbound marketing of the past, interactive marketing creates a two way dialogue between a business and its customers. Any time a customer is invited to provide feedback, express their personal preferences, or offer up demographic information, they are providing information that marketers can use to guide their advertising efforts. Interactive marketing can take many forms, but search engine marketing is one of the most common. When customers type a query into a search engine, they are shown advertising based on their search terms. Bangladesh should develop an interactive website or improve its current website so that potential visitors can contact directly with our responsible authorities. Bangladesh's tourism sector must start taking all the preparations from this moment if it wants to grab the huge development potentiality it possesses. Although we should largely target the foreign visitors, at the same time it mustn't also ignore the increasing prospect of the domestic market of this sector. As mentioned earlier, it is not enough that the country possesses a potential for becoming a covetable tourist destination. To turn that possibility into reality, marketing is a pre-condition. Today, promotional activities through Integrated Marketing Strategy can help Bangladesh to reach its target destination.

## Recommendations

**Renovate to image of Bangladesh:** Bangladesh is suffering from the image problem because of some international media. As a result, many foreigners do not choose Bangladesh as a tourist destination because of either they don't have enough idea about the country and its tourism attractions and facilities or what they have is negative. So, Bangladesh tourism should emphasize first on its promotional measures to correct this negative image.

**Information Technology in Tourism:** The international tourism system is dependent on information technology for its future growth, competitiveness and long-term survival. In

addition to that World Wide Web is the most popular application on the Internet which can be used effectively for the many purpose of tourism marketing including direct sales, advertisement, customer support, etc. Bangladesh tourism authority must consider the effective use of this technology for the promotional activity of this industry. It is worth mentioning here that though Bangladesh Parjaton Corporation has its own web page; it should be well designed containing all the necessary information.

**Promotion of Specific Regions:** If the industry wants to attract more foreign tourists, it needs to publish some creative advertisement in some specific travel guides, magazines, and specialized professional journals that the potential tourists, overseas tour operators, travel agents, and travel writers read.

**Importance of More Funds:** Bangladesh don't have that level of capability to compete with the world's top tourist generating countries, but it has the capability to compete with the member countries of SAARC or at least some other small countries of SAARC except India. To compete with these countries, needs to conduct more promotional measures. But what the amount is allocating presently for this purpose is not sufficient. But it is easy to increase its promotional budget up to 4 or 5 percent of its total earnings from this sector. In addition to that the authority should have a plan for the effective use of the promotional budget because it will again help to increase the earnings by attracting more tourists.

**Significance of Foreign Tour Operators:** Bangladesh Parjaton Corporation and the private tour operators of Bangladesh can maintain the contact and liaison with the foreign tour operators and to influence them to send more tourists to Bangladesh. Even foreign tour operators can be used to distribute the brochure, souvenirs, and tourists' maps of Bangladesh tourism. For this purpose they need to have some incentives. Bangladesh can sell package tours through foreign tour operators where they receive a handsome amount of discount.

**Combine discounted Offers and Group Tours:** Bangladesh can attract more tourists by offering more discounts on group tours and long stay visits. For example, discount on air tickets, hotel rents, discounted price of local transport arranged by the tour operators etc. National airlines have a major role in this regards. Since the position of the national airlines of Bangladesh is not so good, the country can make the mutual arrangement on some selected international airlines. In addition to that the tourism authority should offer more off-season discounts, students discount, SAARC tour rebate etc to motivate the potential tourists to visit Bangladesh.

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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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