

Bank Credit and Economic Growth Nexus: Bangladesh Perspective

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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

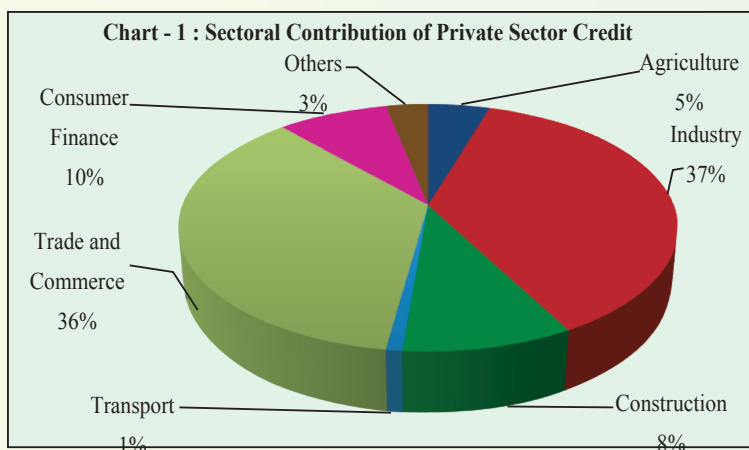
(In percent)

| 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.

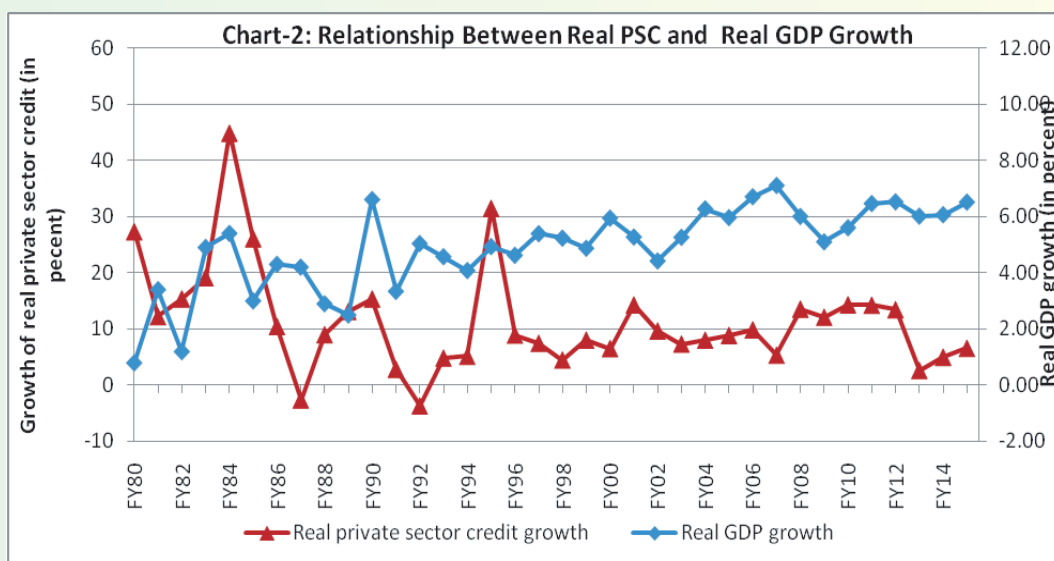


Chart- 2 shows that relationship between real private sector credit and real GDP growth from FY1980 to FY2015. The relationship between the two growth variables appears to be positive but not very strong the entire sample period due mainly to fluctuation in growth of real private sector credit and real 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 Parron (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 (λ_{Trace}) and maximum eigenvalue (λ_{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 | |
| In Levels | | | | | |
| 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) |
| In First Difference | | | | | |
| 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 | | |
|---------------------------|----------------------------------|------------------|-------|----|------------------|-------|----|
| | | λ_{stat} | CV | CE | λ_{stat} | CV | CE |
| λ_{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 |
| λ_{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 λ_{trace} and λ_{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 λ_{trace} and λ_{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 | -0.919 (-15.457) | - | 3 |
| 1 | -0.403 (-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

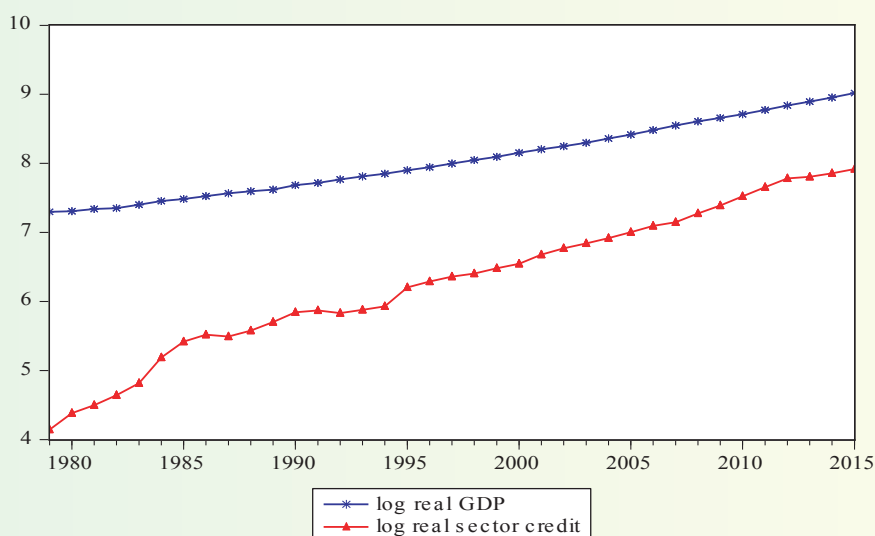
Table 5 : Vector error correction estimates

| Repressors | $\Delta\text{Log RGDP}(t)$ | $\Delta\text{Log RPSC}(t)$ |
|------------------------------|----------------------------|----------------------------|
| Constant | 0.058 (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) | -0.050 (-6.113) | 0.160(2.568) |
| Adjusted R ² | 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

References

- Balago, G. S. (2014). Nexus between Bank Credit and Economic Growth in Nigeria: Evidence from VEC Model. *OALib*, 01(08), 1-12. doi:10.4236/oalib.1100952
- Bayoumi, T., & Melander, O. (2008). Credit Matters: Empirical Evidence on U.S. Macro-Financial Linkages. *IMF Working Papers*, 08(169), 1. doi:10.5089/9781451870275.001
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2003). Law, endowments, and finance. *Journal of Financial Economics*, 70(2), 137-181. doi:10.1016/s0304-405x(03)00144-2
- Beck, T., Levine, R., & Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, 58(1-2), 261-300. doi:10.1016/s0304-405x(00)00072-6
- Bencivenga, V. R., & Smith, B. D. (1991). Financial Intermediation and Endogenous Growth. *The Review of Economic Studies*, 58(2), 195. doi:10.2307/2297964
- Dey, M. K., & Flaherty, S. (2005). Stock Exchange Liquidity, Bank Credit and Economic Growth, Paper presented at the Max Fry Conference on Finance and Development, University of Birmingham
- Enders, W. (2010). *Applied econometric time series* (3rd ed.). Hoboken, N.J: Wiley.
- Estrada, G., Park, D., & Kamayandi, A (2010). Financial Development and Economic Growth in Asia. ADB Working Paper No 233, Metro Manila.
- Femi Kayode, O.F., Edun, A.T., & Obamuyi, T.M. (2010). Bank Lending, Economic Growth and the Performance of the Manufacturing Sector in Nigeria.
- Goldsmith, R. W. (1969). *Financial structure and development*. New Haven: Yale University Press.
- Greenwood, J., & Jovanovic, B. (1990). Financial Development, Growth, and the Distribution of Income. *Journal of Political Economy*, 98(5, Part 1), 1076-1107. doi:10.1086/261720

- Gujarati, D. N. (2003). *Basic economics*. Boston: McGraw-Hill.
- Gurley, J. G., & Shaw, E. S. (1967). Financial Structure and Economic Development. *Economic Development and Cultural Change*, 15(3), 257-268. doi:10.1086/450226
- Islam, R., Habib, W., & Khan, H. (2004). A Time Series Analysis of Finance and Growth in Bangladesh. *The Bangladesh Development Studies*, 30(1,2).
- Jayaratne, J., & Strahan, P. E. (1996). The Finance-Growth Nexus: Evidence from Bank Branch Deregulation. *The Quarterly Journal of Economics*, 111(3), 639-670. doi:10.2307/2946668
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254. doi:10.1016/0165-1889(88)90041-3
- Johansen, S., & Juselius, K. (2009). Maximum Likelihood Estimation And Inference On Cointegration - With Applications To The Demand For Money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210. doi:10.1111/j.1468-0084.1990.mp52002003.x
- King, R. G., & Levine, R. (1993). Financial intermediation and economic development, In Mayer and Vives (Eds): *Financial Intermediation in the Construction of Europe*. Centre for Economic Policy Research, 156-189.
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, 107(2), 407-437. doi:10.2307/2118477
- Marshal. I. et.al. (2015). *Bank Domestic Credits and Economic Growth Nexus in Nigeria (1980-2013)*. Department of Banking and Finance, Faculty of Management Sciences, University of Science and Technology, Nkpolu, Nigeria
- Mishra, P.K., Das K.B., & Pradhan, B.B. (2009). *Credit Market Development and Economic Growth in India*. Middle Eastern Finance and Economics.
- Onuorah, A.C., & Ozurumba, B.A. (2013). Bank Credits: An Aid to Economic Growth in Nigeria. *Information and knowledge Management*, 3, 41-51.
- Pagano, M. (1993). Financial markets and growth. *European Economic Review*, 37(2-3), 613-622. doi:10.1016/0014-2921(93)90051-b
- Papaioannou, E. (2007). Finance and Growth A Macroeconomic Assessment of the Evidence from A European Angle, *European Central Bank, Working Paper Series*, No. 787, July.
- Schumpeter, J.A. (1952). *The Theory of Economic Development*. Harvard University Press, Cambridge.
- Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65. doi:10.2307/1884513
- Timsina, N. (2014). *Impact of Bank Credit on Economic Growth in Nepal*, NRB Working Paper No. 22 June 2014, Nepal Rastra Bank, Research Department, Baluwatar, Kathmandu, Nepal.
- Zhang, J., Wang, L., & Wang, S. (2012). Financial Development and Economic Growth: Evidence from China. *SSRN Electronic Journal*. doi:10.2139/ssrn.1983654