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The Nexus between Financial Development and Economic Growth in Bangladesh

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ABSTRACT

The relationship between financial development and economic growth has been the subject of increasing attention over the 21st century. This study is basically an econometric analysis of financial development and economic growth in Bangladesh involving time series data of real GDP growth rate, domestic credit provided by financial sector, domestic credit to private sector, and broad money supply from 1974 to 2015. This research employs Johansen's multivariate cointegration procedure to test the long-run relationship, while vector error correction model is used to test the causal relationship between financial development and economic growth. Johansen's cointegration test reveals the presence of a long-term relationship between financial development and economic growth in Bangladesh. Results of ECM provide the evidence of the bidirectional causal relationship between financial development and economic growth. Thus, right and effective monetary policy is very important to accelerate economic growth as both supply-leading and demand-following hypotheses are effective in Bangladesh.

KEYWORDS: Financial Development; Economic Growth; Cointegration; VECM

I. INTRODUCTION

Financial development and economic growth are two important components of economic development. These two components play vice versa causal role to build up economic development. There is still old argument concerning the direction of causality between financial development and economic growth to the power of influence and the way of financial factors impact. In recent years, the relationship between financial development and economic growth has become an issue of extensive analysis. The theoretical relationship between financial development and economic growth goes back to the study of Schumpeter (1911) who identified on the services provided by financial intermediaries and argues that these are essential for innovation and development. Patrick (1966) identifies two possible directions of causality between financial development and economic growth. These relationships are labeled as the supply-leading and demand-following hypothesis. The demand-following view postulates a causal relationship from economic growth to financial development. In contrast, the supply-leading view postulates a positive impact of financial development on economic growth, which means that the creation of financial institutions and markets increases the supply of financial services and thus leads to economic growth.

The relationship between the financial development and economic growth is important for economic development in Bangladesh. Bangladesh experienced an average 4.76% GDP growth rate over the period from 1974 to 2015 (World Bank, 2016). The trend of financial development indicators also conclusively implies that Bangladesh performed well over the 42 years from 1974 to 2015 relative to other countries in this region. Though India has experienced a higher average rate of growth in GDP and financial development from 1974 to 2015, Bangladesh is performing better than any other South Asian countries from the 1990s. The above growth scenario motivates us to find the cointegration and causal relationship between financial development and economic growth of Bangladesh. The specific objectives of this research are as follows: i. To investigate the short-run and long-run relationship between various indicators of financial development and economic growth; ii. To assess the causality and direction of causality between indicators of financial development and economic growth.

This research is organized as follows: section 2 reviews the literature; data and methodology are provided in section 3;

section 4 presents the empirical findings, and finally, section 5 concludes the study.

II. Literature Review

The relationship between financial development and economic growth has been the subject of growing attention over the past few decades. Goldsmith (1969) empirically shows the existence of a positive relationship between financial development and GDP per capita. Levine et al. (2000) find that the development of financial intermediation affects growth positively, and that cross-countries differences in legal and accounting system largely account for different degrees of financial development. Rahman (2004) investigates the association between financial development and economic growth in case of Bangladesh over the period of 1976-2005. Applying the structural VAR approach, he reports that financial development supports investment which increases economic growth. This confirms the validity of supply side hypothesis in Bangladesh. Ang and McKibbin (2005) examine the causal relationship between financial development and economic growth in Malaysia using time series data from 1960 to 2001. The ratio of liquid liabilities (or M3) to nominal GDP, commercial bank assets to commercial bank plus central bank assets, and ratio of domestic credit to private sector to nominal GDP are used to construct an index as a proxy for financial depth using principal components analysis. The findings suggest that growth exerts a positive and unidirectional causal effect on finance in the long-run. Khan et al. (2005) investigate the link between financial development and economic growth in Pakistan over the period 1971-2004. The study shows a positive impact of real deposit rate on economic growth. The authors recommend that policy-makers should focus attention on long-run policies to promote economic growth. Guryay et al. (2007) examine the link and causal relationship between financial development and economic growth on Northern Cyprus. Applying the tool of Ordinary Least Squares (OLS), the authors utilize time series data for 18 years, covering the periods of 1986-2004. Their findings reveal an insignificant positive relationship between financial development and economic growth. Another important finding worthy of reporting has to do with the direction of the causality between the two variables. Results from this test reveal that the causality runs from economic growth to financial development. Sanusi and Salleh (2007) examine the relationship between financial development and economic growth in Malaysia covering the period 1960-2002. Three measures of financial development are used, namely, Broad Money to GDP, Domestic Credit Provided by the Banking System, and Domestic Credit to Private Sector to GDP. By employing the autoregressive distributed lag approach, the study finds that ratio of broad money to GDP and credit provided by the banking system have positive and statistically significant impact on economic growth in the long run. The results further indicate that a rise in investment enhances economic growth in the long run. Pradhan (2009) examines the long run and short-run dynamics between financial development and economic growth using time series data over the period 1993-2008 in India. Applying the Johansen cointegration test, which confirms the existence of cointegration, the author declares a positive long-run relationship between financial development and economic growth. The Granger causality test confirms the interdependence between financial development and economic growth in India. Considering this bidirectional relationship, the researcher documents that the effect of financial development must be considered as a policy variable necessary to stimulate economic growth and vice versa. One notable weakness of this study is the use of industrial production which is not really a sufficient proxy for economic growth. Chakranorty (2010) investigates the finance-growth nexus in India using different indicators of financial development and reports that stock market capitalization (financial development indicator) adds in economic growth. Using rolling regression, Hye (2011) investigates the relationship between financial development and economic growth in case of India over the period of 1973-2008. He notes that financial development impedes economic growth. Hye and Islam (2013) investigate the relationship between financial development and economic growth in Bangladesh using time series data over the period of 1975-2009. The ARDL bounds testing approach to cointegration is applied to test whether cointegration between variables exists. They find that the variables are cointegrated in the long run and financial development impedes economic growth.

We find that researchers’ use different indicators of financial development and different studies use different econometric techniques. Empirical results are found mixed, so this is basically an issue of empirical investigation.

III. Data and Methodology

A. Data and Data Description

The study uses time series data of real GDP growth rate, Domestic Credit provided by the Financial Sector (as % of GDP) - DCBS, Domestic Credit provided by the Private Sector (as % of GDP)-DCPS, and M2 as Broad Money covering the period from 1974 to 2015. The data of real GDP growth is used as dependent variable and as a proxy for economic growth. Data of DCBS (as % of GDP), DCPS (% of GDP), and M2 (as % of GDP) are used as an independent variable and as indexes of financial development. These data are collected from the World Development Indicators (2017) of the World Bank.

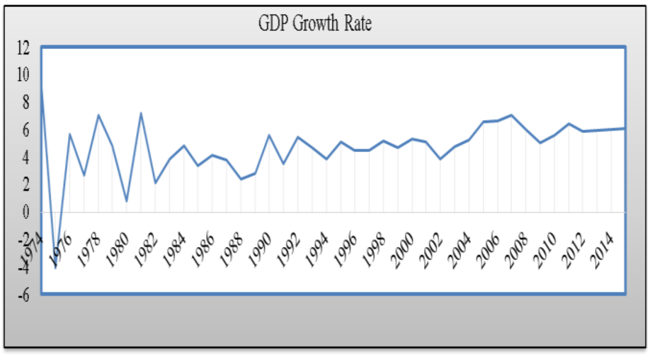

Figure 1: GDP Growth Rate

Figure 1 shows the trends of GDP growth rate of Bangladesh. GDP growth rate of Bangladesh falls from 9.56 percent in 1974 to -4.09 in 1975. This is perhaps because of the effect of famine, heavy rainfall, massive flooding in 1974. The GDP growth has started increasing sharply and reached 5.66 percent in 1976. Till 1990 from 1984 there was remarkable ups and downs in GDP growth rate. After that, till 2004 the growth rate was fluctuating slowly with an average rate of growth rate of around 5.00 percent. In 2007 the GDP growth rate reaches a peak at 6.4 percent. After 2011 the GDP growth rate was almost stable. GDP growth rate of Bangladesh is an upward positive trend till 2015. Figure 2 shows financial development indicators growth rate of Bangladesh. Trends of M2, DCPS, and DCBS as a percentage of GDP conclusively suggest that the growth rates gradually rise over time from 1974 to 2015. Average rates of growth of M2 in Bangladesh is 32.09%, while DCPS grows with 20.30% over the 42 years.

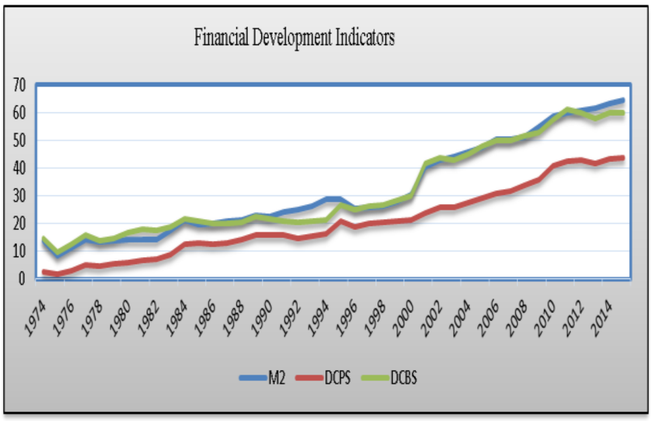

Figure 2: Financial Development Indicators Growth Rate

B. Unit Root Test

A test of stationarity or non-stationarity that has become widely popular over the past several years is the unit root test. There are several unit root tests to examine stationarity of the time series. The most famous tests are the augmented Dickey-Fuller test (ADF) and Phillips–Perron (PP) test. Both these tests use the existence of a unit root as the null hypothesis. ADF and PP tests are used in this study to fulfill the precondition of cointegration analysis for the data series of the variables. Dickey and Fuller (1981) have developed an augmented version of DF test, known as the Augmented Dickey-Fuller (ADF). This test is conducted augmenting the preceding three equations by adding the lagged values of the variable ΔY_t. To be specific, Augmented Dickey-Fuller (ADF) unit root test is based on the following regression equations.

$$\Delta Y_t = \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \quad \text{(no trend, no intercept)} \quad (1)$$

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \quad \text{(intercept only)} \quad (2)$$

$$\Delta Y_t = \alpha + \beta T + \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \quad \text{(trend and intercept)} \quad (3)$$

where α is an interecpt (constant), β is the coefficient of time trend T, γ and δ are the parameters where, $\gamma = \rho - 1$, ΔY_t is the first difference of Y_t series, m is the number of lagged first-differenced term, and ε_t is the error term.

The test for a unit root is conducted on the coefficient of Y_{t-1} in the regression. If the 't' statistic is less than the critical 't' values, the null hypothesis of a unit root cannot be rejected for the time series and hence, one can conclude that the time series is non-stationary at their levels.

This study also uses Phillips-Perron (PP) unit root test due to some drawbacks of the ADF Test. Phillips-Perron (1988) develops a non-parametric unit root test. The PP test is modified from DF test so that serial correlation does no longer affect their asymptotic distribution. Whilst the ADF test addresses lag of ΔY as regressors in the test equation, the PP test makes a non-parametric correction to the t-test statistic. The PP tests correct for any serial correlation and heteroscedasticity in the errors ε_t of the test regression by directly modifying the test statistic.

C. Test of Cointegration

In economics, cointegration is most often associated with economic theories that imply equilibrium relationships between time series variables. Finance-Growth theory implies cointegration between GDP growth and financial development indicators. The equilibrium relationships implied by these theories are referred to as long-run equilibrium relationships, because the GDP growth and financial development indicators that act in response to deviations from equilibrium may take a long time to restore equilibrium.

We apply Johansen's multivariate cointegration procedure to test the long run relationship (Johansen and Juselius, 1990). Johansen's multivariate cointegration test is based on VAR model. Johansen methods allow us to determination of the number of cointegrating vector. These tests directly investigate the integration in VAR model. Johansen and Juselius approach based on VAR model can be expressed mathematically as:

$$Y_t = \alpha + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad (4)$$

where Y_t is a vector containing n variables of I(1) at time t, α is an $(n \times 1)$ vector of constants, A_p is an $(n \times n)$ matrix of coefficients, ρ is the maximum lag included in the model and ε_t is an (n × 1) vector of error terms.

As in Enders (2004), Equation (4) can be written in the form of the error correction model assuming cointegration of order ρ as:

$$\Delta Y_t = \alpha + (A_1 - I)Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad (5)$$

or in a final broad form as:

$$\Delta Y_t = \alpha + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_{p-1} \Delta Y_{t-p+1} + \Pi Y_{t-p} + \varepsilon_t \quad (6)$$

Where, $\Gamma_i = (A_1 + A_2 + \cdots + A_{p-1} - I)$ represents the dynamics of the model in the short run. In Equation (6), $\Pi = (A_1 + A_2 + \cdots + A_p - I)$ represents the long run relationship among the variables included in the vector Y_t, and I is the identity vector. The key idea of the Johansen and Juselius approach is to determine the rank of the matrix Π, which represents the number of independent cointegration relationship.

Johansen (1988) suggests two test statistics named trace and eigenvalue test statistic for estimating the number of cointegrating vectors or equations. According to the Trace test, the null hypothesis (H_0) is that the number of distinct cointegrating vector is less than or equal to r against the alternative hypothesis of more than r cointegrating vectors. The trace statistic is computed from the following equation:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (7)$$

According to the maximum eigenvalue test, the null hypothesis (H_0) is that the number of cointegrating vectors is r, against an alternative of (r+1) vectors. The maximum eigenvalue statistics is computed as:

$$\lambda_{max}(r, r+1) = -T ln(1 - \lambda_{r+1}) \quad (8)$$

Where, λ_i denotes the estimated values of the characteristic roots obtained from the estimated; *T* is the number of observations. In order to perform the Johansen cointegration test, the first step is to calculate the trace and maximum eigenvalue statistics then compare these to the appropriate critical values.

D. Error Correction Model (ECM)

Having verified if the variables under study (GDP, DCBS, DCPS, and M2) are cointegrated, vector error correction model can be formulated to determine the direction of causality among the variables. According to Granger representation theorem, the relationship among GDP, DCBS, DCPS, and M2 can be expressed in the error correction mechanism as follows:

$$\Delta GDP_{i,t} = \alpha_1 + \sum_{i=1}^{\rho} \alpha_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \alpha_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \alpha_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \alpha_s \Delta M2_{t-s} + \theta_1 ECT_{t-1} + \varepsilon_i \quad (9)$$

$$\Delta DCBS_{i,t} = \beta_1 + \sum_{i=1}^{\rho} \beta_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \beta_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \beta_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \beta_s \Delta M2_{t-s} + \theta_2 ECT_{t-1} + \varepsilon_i \quad (10)$$

$$\Delta DCPS_{i,t} = \gamma_1 + \sum_{i=1}^{\rho} \gamma_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \gamma_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \gamma_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \gamma_s \Delta M2_{t-s} + \theta_3 ECT_{t-1} + \varepsilon_i \quad (11)$$

$$\Delta M2_{i,t} = \delta_1 + \sum_{i=1}^{\rho} \delta_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \delta_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \delta_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \delta_s \Delta M2_{t-s} + \theta_4 ECT_{t-1} + \varepsilon_i \quad (12)$$

Where, difference operator is indicated by Δ while ECT shows residual or error correction term resulted from long-run cointegrating equation represents the deviation from the equilibrium in time period *t*, (-1 < θ_i < 0). The short-run parameter represents the response of dependent variable in each period starts from equilibrium. The constant terms are denoted by α_1, β_1, γ_1 and δ_1 in VECM equations and the residual terms ε_i (i=1, 2, 3, 4) is assumed to be normally distributed.

IV. Empirical Results

We perform ADF and PP unit root tests on all four series in levels and first differences in order to determine the univariate properties of the data employed in the analysis. To investigate the stationary properties of the variables we run the regression analysis without the intercept and trend term. Results are presented in Table 1. It is clear from Table 1 that all of the variables are non stationary in their level forms as the calculated ADF statistics are smaller than the critical values. Results reveal that all the variables are stationary in their first difference form without intercept and trend at 1% level of significance.

Table 1: Results of ADF and PP Unit Root Tests

Variables	Level		First Difference	
	ADF	PP	ADF	PP
GDP	0.2649 (0.76)	-2.2371 (0.13)	-8.3130 (0.00)	-23.0284 (0.00)
M2	3.6832 (0.99)	3.7904 (0.99)	-4.5526 (0.00)	-4.6814 (0.00)
DCPS	4.2527 (1.00)	4.5851 (1.00)	-4.2749 (0.00)	-4.2161 (0.00)
DCBS	-2.5973 (0.99)	2.9846 (0.99)	-5.4076 (0.00)	-5.4343 (0.00)

Note: MacKinnon (1996) one-sided p-values are presented in first brackets.

Having established that all variables are integrated of the same order, we proceed with the Johansen multivariate cointegration tests which allow us to test for long-run relationship between financial development and economic growth. The initial step for establishing the presence of a long-run relationship among the variables is to determine the optimal lag length for the VAR system. Lag-length misspecification for the VAR model often generates autocorrelated errors (Lütkepohl, 2005). To perform this step, five different criteria including the sequential modified likelihood ratio (LR) test statistic, final prediction error criteria (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn information criterion (HQ) are used to determine the lag lengths used in the VAR. These criteria are widely used in the literature (Lütkepohl, 2005; Enders, 2007). We proceed for each criterion with a maximum of 4 lags. Residual Serial Correlation Lagrange multiplier (LM) test is also performed to find out if there is mutual statistical independence for the different error terms. If the residuals do not fulfill the condition, then linear dependencies exist among the residuals and hence, they are said to be autocorrelated. Using 1 lag produces no autocorrelation in the VAR model for up to 4 lags. So, we accept VAR (1) model for cointegrating analysis. Tables 2 presents the Johansen cointegration test results.

Table 2: Cointegration Results

H_0	H_A	Trace statistics	5% critical value	Maximum eigenvalue statistics	5% critical value
No deterministic trend					
r = 0	r=1	42.0932*	40.1749	25.2951*	24.1592
r=1	r=2	16.7981	24.2760	11.7010	17.7973
No deterministic trend (restricted constant)					
r = 0	r=1	65.2283*	54.0790	33.0968*	28.5881
r=1	r=2	32.1315	35.1928	22.2731	22.2996

Note: Both trace and Maximum-eigenvalue test indicate 1 cointegrating equation at the 5 percent level.

Tables 2 shows the cointegration results among the variables. According to Table, both trace and maximum eigenvalue test indicates the rejection of null hypothesis of no cointegrating relationship at 5 percent level of significance as the calculated statistics are greater than the critical values and hence accept the alternative hypothesis that there is cointegrating relationship among the variables. This indicates the existence of one cointegrating relationship among the variables in Bangladesh. It suggests the presence of a long-term relationship among the variables (GDP, DCBS, DCPS, and M2) in Bangladesh.

Results of Granger causality based on error correction models are presented in Table 3. Coefficient of the error correction term for the cointegrating equation GDP=f(M2,DCBS,DCPS) is negative and highly significant. It indicates that the causal relationship is running from M2, DCPS, and DCBS to GDP. Moreover, the ECT of M2=f(GDP,DCBS,DCPS) and DCPS=f(GDP,DCBS,M2) are significant and negative. Thus, the causal relationship is running from economic growth (GDP growth) to financial development (M2 and DCPS). This result implies that bi-directional causality exists between financial development and economic growth in Bangladesh. Results imply that the finance-led growth and growth-lead finance hypothesis exists for Bangladesh.

Table 3: Vector Error Correction Estimates

Error Correction	D(GDP)	D(M2)	D(DCPS)	D(DCBS)
Cointegrating Equation 1	-0.840770	-0.704534	-0.473048	-0.499146
	(0.19793)	(0.30922)	(0.19376)	(0.36700)
	[-4.24792]	[-2.27845]	[-2.44143]	[-1.36006]

Note: Standard errors are in ( ) & t-statistics in [ ]

V. CONCLUSION

In this study, the dynamics of the relationship between financial development and economic growth in Bangladseh is analyzed using time series econometric techniques for the period 1974 to 2015. Johansen based cointegration results reveal the presence of a long-term relationship between financial development and economic growth. Subsequently, we verify the causal relationship between the variables by using ECM based causality analysis. The ECM results show that there is a bidirectional causal relationship running between financial development and economic growth in Bangladesh. The study suggests that financial development has a significant effect on economic growth and vice versa in Bangladseh. Hence, the contribution of financial development to economic growth is considerable. It may therefore be recommended that policies ought to be directed to accelerate improvements in the financial sector. Future researches can be focused on the impact of financial liberalization on financial development and thereby economic growth.

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