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FINANCIAL SECTOR DEVELOPMENT AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM BANGLADESH

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ABSTRACT

For centuries, researchers have focused on the question "Whether the demand for growing financial sector is created by economic development or the financial development influences economic growth". This paper empirically examines the association between financial development and economic growth in Bangladesh using time series data over the period of 1977-2016. In order to fulfill the main objective it has adopted Johansen Co-integration test and Granger-causality test in Vector Error Correction Model (VECM) framework. The study has found the significant long-run causality from financial development to economic growth in Bangladesh. Furthermore, the investigation confirmed that the disequilibrium in long-run GDP growth rate is corrected by 43.84% in short-run i.e. next following year. In addition, variance relation among the variables has examined by using variance decomposition model. The findings of this study have brought to light the propulsive role of financial development, particularly credit circulation to private sector, in economic activities in Bangladesh.

Contribution/ Originality: This study contributes in the existing literature of finance growth hypothesis by using Granger causality test within Vector Error Correction Model (VECM) framework. It is one of very few studies in Bangladesh which have investigated the feedback causality between financial development and economic growth.

1. INTRODUCTION

The contribution of financial sector in economic development is very important in Bangladesh. When identifying the relationship between financial development and economic growth, we must evaluate our financial system which leads to attain productivity and economic growth. Predominantly, financial system is related to formation and allocation of capital, mobilization of savings, exchanging funds between lenders and borrowers. This financial system varies country to country due to the lack of well-functioning financial markets. In developing countries like Bangladesh, financial markets can positively contribute to economic growth if it is well organized and well functioned.

The general concept of financial development refers to the enhancement and base of financial instruments which are economically accessible in a country whereas financial growth refers to the changes in financial system in

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terms of its size and structure. In other words, financial growth means the development of financial markets (Erim and Turk, 2005). Financial system operates long run and short run relationship between finance and growth. The Financial Development Report 2011which was published by the World Economic Forum, destines the term 'financial development' as "*the factors, policies, and institutions that lead to effective financial intermediation and markets, as well as deep and broad access to capital and financial services*" An effective financial system leads an economy to increase its growth rate. Contrariwise, the deteriorated financial system unfavorably affects the economy as well as economic growth.

The purpose of this study is to find out the long run equilibrium link between financial development and economic growth and the short run dynamics of financial development in Bangladesh based on the time series data from 1977 to 2016. The economic performance as well as the overall financial development of Bangladeshi economy can be evaluated by estimating its real GDP growth. To achieve a long-run sustainable economic growth, the economy should improve its financial development. So financial development is the main propeller of economic growth. However, different results of financial development and economic growth came from different schools of thought. A financial system which performs its financial functions would contribute to the economic growth in the long term (King and Levine, 1993a;1993b; Arestis and Demetriades, 1997; Thiel, 2001; Eschenbach, 2004; Lawrence, 2006; Shan and Jianhong, 2006). The researcher finds that the growth of financial institutions including the role of bank-based intermediation is very essential for economic growth because the decisions of savings, investment and the growth of economy are affected by the functions of financial institutions relying on the various rules and regulations of law. The financial institutions and markets can help financial development and economic growth through the proper allocation of risk and return.

This paper is organized into different sections. The first section includes the introduction of this paper. The second section summarizes the literature review about financial development and economic growth. Section 3 describes data and methodology employed. Section 4 presents and discusses empirical results. Finally section 5 contains concluding remarks.

2. LITERATURE REVIEW

Several studies have been conducted to find out the relationship between financial development and economic growth. Some resulted that financial development has a positive relationship with economic growth, but also negative from other studies.

Adu *et al.* (2013) conducted a study on financial development and economic growth in Ghana by using eight indicators to proxy for financial development and their result of financial development and its growth effect is sensitive to the choice of proxy used due to the high correlation among the indicators. It was also substantiated from this study that the relationship of private sector credit to GDP ratio positively affect financial development and the relationship of broad money supply to GDP ratio negatively affect financial development on economic growth for five developing countries using the time series data beginning from1989 to 2010.They also found the result that trade openness, financial development and foreign investments affect economic growth.

Samargandi *et al.* (2013) examined that the financial development of Saudi Arabia (an oil-rich economy) was related to economic growth based on the ARDL approach. The study reports that financial development positively affect the Soudi non-oil sector of the economy in the long run.

Ang (2008) captured an explicit understanding of financial development and economic growth for Malaysia. They identified that financial development has positive impact on economic growth which leads to higher output growth and facilitates saving, capital formation and long-term economic growth.

A study was held over the period of 1977 to 2006 by Eita and Jordaan (2007) to identify the causality runs of financial development and economic growth of Botswana. The conclusion was that economic growth of Botswana was affected by financial development in the long run.

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Oluitan (2012) explored the financial institutions activity and economic growth for thirty-one African countries covering the period of 1970 to 2005 which identified that economic growth was influenced by private sector credit. He mentioned in his study that financial development is bi-directionally related with economic growth.

Ndlovu (2013) tried to identify the causal relationship between the financial system development and economic growth from Zimbabwean perspective based on multivariate Granger causality test. The study reveals that the economic growth in Zimbabwe is not improved by financial development.

Hassan *et al.* (2011) carried out a research study intended to point out a positive relationship between financial development and economic growth by using low and middle-income countries. The study pertained to two-way causality relationship between finance and growth in the short run for most regions.

Kar *et al.* (2011) in their experimental study, examined the direction of causality between financial development and economic growth based on fifteen Middle East and North African (MENA) countries beginning from the period of 1980 to 2007 and six financial development indicators. Their study concluded that the direction of causality is very impressible to the assessment of financial development and the causality between financial development and economic growth varies across countries in the MENA region.

To estimate the impact of financial development on economic growth, Valickova (2013) employed meta-regression analysis and enquired 1334 estimates from 67 studies to examine stock market development and banking sector development. The results found that the stock market studies have a positive coefficient of 0.06 and the banking sector studies have a negative coefficient of -0.09 which indicated that stock markets contribute economic growth more than that of financial intermediaries.

Rehman *et al.* (2015) showed the linkage between the financial development and the economic growth in Bahrain covering the time series data from 1981 to 2013.They tried to find relationship among financial development, savings and the economic growth in the short run and long run using tri-variate casualty model. They selected Vector Autoregressive Model which identified the significant relationship between economic growth and savings but Johansen co-integration analysis failed to determine the long-term relationship among financial development, savings and economic growth. The study also reveals bi-directional causality between economic growth and savings at 10 percent significance level according to Granger test.

Vazakidis and Adamopoulos (2009) applied Vector Error Correction Model (VECM) to investigate the causal relationship between financial development and economic growth in Greece covering the data of 30 years from 1978 to 2007. It has been found that economic growth affects stock market development and credit market development positively through industrial production growth in Greece.

Anwar and Nguyen (2009) vindicated the strong and explicit link between financial development and economic growth of 61 regions of Vietnam by using the period of 1997 to 2006 based on endogenous growth model. They also explored that financial development leads to economic growth in Vietnam.

Jalil and Ma (2008) analyzed the effect of financial development on economic growth in Pakistan and China covering the period of 1960-2005 using ARDL bound testing approach to co-integration. They also identified that the principal determinants of financial development are deposit liability ratio (DLR) and credit to private sector ratio (CPS). It was substantiated that both DLR and CPS affect economic growth positively and significantly in Pakistan but in China, only DLR affect economic growth positively and significantly. The study reported that insignificant impact of CPS on economic growth leads to inefficient allocation of credit as well as delays the overall growth in China.

Liang and Teng (2006) carried out an investigation of long run relationship among financial development, economic growth and other key growth factors of China enclosed by multivariate vector autoregressive (VAR) framework. The study reports that financial development, physical capital stock, international trade and real interest rate all have economic and significant impact on economic growth.

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Kaushal and Pathak (2015) viewed that there is causal relationship among Trade Openness, Financial Development and Economic Growth in India beginning from 1991 to 2013. They also mentioned that trade openness and financial development have no causal effect on economic growth on the basis of the result of Vector auto-regression and Granger Causality test. Conversely, economic growth has causal effect on trade and Financial Development. The study recommends that the adoption of economic policies in India supports economic growth.

Murinde (2012) examined conceptual models of recent empirical work. The study reports financial development in terms of financial markets and institutions which is significant for economic growth.

Abu-Bader and Abu-Qarn (2008a) placed the significant link between finance and growth on the basis of the research result of VAR model, Granger causality test and Modified wald test (MWALD) collecting data from six Middle Eastern and North African countries. The study supports finance-led growth in Algeria, Egypt, Morocco and Tunisia and finds unidirectional causality of those countries.

Abu-Bader and Abu-Qarn (2008b) researched Granger causality between finance and growth in Egypt over the period of 1960-2001 using VECM, unit root tests, cointegration test and Granger causality test. They also reported the bidirectional causality between finance and growth.

Yucel (2009) in assessing the causal relationship among financial development, trade openness and economic growth in Turkish economy carried out his own study and found that economic growth is positively influenced by trade openness as well as economic growth is negatively correlated with financial development.

Many researchers used various econometric techniques to examine the relationship between financial development and economic growth. Autoregressive distributed lag (ARDL) bound testing approach was utilized by Al-Malkawi *et al.* (2012) to find the relationship of finance and growth. Ahmed and Ansari (1998) applied Cross-sectionally heteroscedastic and time-wise autoregressive model. Johansen co-integration and Granger causality tests were applied by Iyare and Moore (2011) and Perera and Paudel (2009). Contemporaneous regressions, sensitivity analysis and Panel data analysis were employed by King and Levine (1993) and Levine and Zervos (1998). Cross-sectional analysis and dynamic panel techniques were applied by Levine *et al.* (2000); Odhiambo (2008) utilized Tri-variate causality model. Rousseau and Wachtel (1998) applied Vector auto .regression (VAR) and Vector error correction model. Wood (1993) applied lag-length parameterization of the time series. Wong and Zhou (2010) used of panel regression to determine the relationship between finance and economic growth.

Atje and Jovanovic (1993) identified how economic growth is influenced by the volume of stock market transactions. They also expressed that the role of the stock market is very significant on economic growth.

After taking oil prices and foreign exchange rate into account (Ono, 2017) found that economic growth accelerate financial development in Russia i. e. demand following responses for the time period 1999 to 2008 while, for the time period 2009 to 2014, causality existed only between bank lending and economic growth.

Qamruzzaman and Jianguo (2017) examined the relationship between financial innovation and economic growth in Bangladesh and revealed the existence of bilateral causality between the economic growth and financial innovation both in short run and long run.

Iheanacho (2016) carried out an investigation about the impact of financial development and economic growth in Nigeria by using ARDL approach. He found that the long run link between financial intermediary development and economic growth in Nigeria is insignificantly negative.

Puatwoe and Piabuo (2017) also used the Autoregressive Distributed Lag (ARDL) technique to investigate the influence of financial sector development on economic growth in Cameroon. They found that financial development positively and significantly affect economic growth.

Munyanyi (2017) examined the dynamic relationship between financial development and economic growth in Zimbabwe using time series data (1965-2015). The study concluded that association between financial development and economic growth is based on demand following hypothesis.

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A study on Financial development and economic growth performed by Ogwumike and Salisu (2012) revealed a positive long run causality between financial development and economic growth in Nigeria.

Shahbaz *et al.* (2015) conducted a study to testify the nexus between financial development and economic growth and the role of capitalization in Bangladesh by applying the combined Bayer-Hanck co-integration technique. The research found that though there exists a bilateral causality between financial development and economic growth, the capitalization impede the causality.

3. DATA AND METHODOLOGY

3.1. Data and Sources

This study used annual time series data of all variables (dependant and independent) for the period 1977-2016 (40 years). All the data are extracted from world development indicator database of the World Bank.

GDP growth rate has been used in this study as a proxy for economic growth indicator. In order to capture financial development, growth rate of Domestic credits to private sector relative to GDP and Broad Money (M2) as a percentage of GDP used as proxy variables. Moreover, some macro economic variables i.e. gross domestic savings, gross capital formation also called gross domestic investment and inflation have been used to capture their impact on economic growth. Data analysis has carried out using statistical package Eviews 7.2. Figure 1 exhibits a graphical representation of the research variables.

Definitions of Variables used in this study with their expected effect are as follows:

(i) GDP growth rate : Widely used indicator of economic growth which measures how fast an economy changes from one time period to another time period. The percentage change at which the economy grows from 1 year to another year.

(ii) DCP : Domestic Credit to private sector (DCP) refers total financial contributions through loans, trade credits and other accounts receivable to private sector by financial corporations such as monetary authorities, deposit money banks, finance and leasing companies, money lenders, insurance corporations, and pension funds. This paper used DCP as a percentage of GDP and expected to positively affect economic growth.

(iii) BM : Broad Money (BM) as a percentage of GDP and expected to positively/negatively affect growth. As defined by the World bank Board Money includes the sum of currency outside banks; demand deposits; time, savings, and foreign currency deposits of resident sectors other than the central government. It also includes bank and traveler's checks; and other securities such as certificates of deposit and commercial paper.

(iv) GDS : Gross Domestic Savings (GDS) as a percentage of GDP and expected to positively/ negatively affect growth. GDS is the remaining value of an economy after subtracting final consumption expenditure (total consumption) from GDP.

(v) GCF : Gross Capital Formation (GCF) also called gross domestic investment as a percentage of GDP and expected to positively affect growth. GCF refers to the change in the level of fixed asset and inventories in the economy. Fixed assets include land improvements; plant, machinery, equipment purchases; the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings

(vi) INF : Inflation rate and expected to negatively affect economic growth. Measured in percentage change in the GDP deflator.

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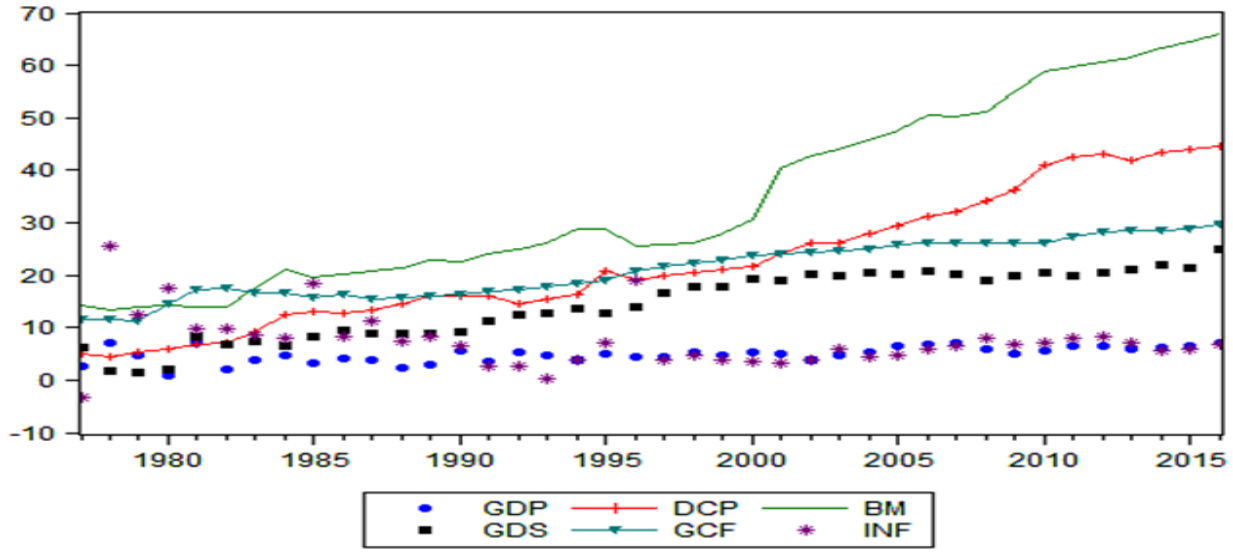

Fig-1. Graphical representation of the research variables.

Source: World Development Indicator, 2016

3.2. Model Specification and Estimation Procedures

3.2.1. Model

In order to estimate the empirical association between financial development and economic growth, this paper has adopted co-integration technique and Granger-causality test in Vector Error Correction Model (VECM) framework.

The preliminary functional and econometric model showing link between the variables of the study can be specified thus:

Economic Growth = f (Financial development, Savings, Investment and Inflation) (1)

$$GDP = \alpha + \beta_1 DCP_t + \beta_2 BM_t + \beta_3 GDS_t + \beta_4 GCF_t + \beta_5 INF_t + \varepsilon_t \quad (2)$$

Where,

α = constant term

GDP= Gross domestic product growth rate

DCP= Domestic Credit to Private Sector (%GDP)

BM= Broad Money (%GDP)

GDS= Gross Domestic Savings (%GDP)

GCF= Gross Capital Formation (%GDP)

INF= Inflation Rate

ε_t = error term assumed to be normally, identically and independently distributed , while β_1, β_2, β_3, β_4, β_5 are coefficient.

Assumptions of Gauss-Markov are used in this study for testifying the validity and strength of the Ordinary Least Square (OLS). These assumptions include, model's linearity , unbiased estimation (α, β_1, β_2, β_3, β_4, β_5) with expected value of zero i.e. $E(\varepsilon_t) = 0$ and distribution with equal variance (homoscedasticity).

3.2.2. Estimation Procedure

Unit Root Test

Spurious regression refers that two non-stationary time series (dependent and independent) may show strong relationship while no causality exists between them. Before using regression model for forecasting and other purposes it is very important to test for stationary in time series data to avoid spurious causality. If mean, variance and auto-covariance (at various lags) of a time series remain constant over time, then the series is said to be

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stationary process (i.e. has no unit root) otherwise it is called non-stationary time series (i.e. has unit root) (Gujarati and Porter, 2009).

To testify stationarity and examine integrated order in time series data this study carried out two widely used popular unit root tests- Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP). If a time series is found stationary at level (without differencing, for instance, Z_t), it is referred to as *I(0)* or integrated of order 0. On the other hand, if a series is found stationary at first difference (for instance, $Z_t - Z_{t-1}$), it is referred to as integrated of order 1 or *I(1)*.

Augmented Dickey-Fuller (ADF) test

Augmented Dickey-Fuller (ADF) is based on the following regression equations:

$$\Delta Y_t = \lambda_0 + \lambda_2 t + \delta Y_{t-1} + \sum_{i=1}^{n} \vartheta_i \Delta Y_{1-i} + \varepsilon_t \quad (3)$$

Where, λ_0 is a constant term, n for lagged difference term, $\lambda_2 t$ represent the trend , $\Delta Y_t = Y_t - Y_{1-I}$ and ε_t is a pure white nose term.

The Null hypothesis and Alternate hypotheses of left-skewed ADF are as under:

H_0: $\delta = 0$ (unit root) H_1: $\delta < 0$ (stationary)

Phillips-Perron (PP) Test

Another popular test for finding unit root in time series is Phillips-Perron (PP) test. PP uses non-parametric statistical method to deal with serial correlations and heteroskedasticity in the error terms without adding lagged difference terms. The regression equation for pp test is:

$$\Delta Y_t = \lambda_0 + \lambda_2 t + \delta Y_{t-1} + \varepsilon_t \quad (4)$$

Hypothesis for PP is same as shown above for ADF.

For Both ADF and PP test, H_0 is tested under three different assumptions for each of the series: (1) with drift and deterministic trend as shown above (2) with only drift, or (3) without drift and deterministic trend. If time series has unit root at level under any of the above three assumptions this study consider it as a non-stationary data.

Johansen Test for Co-Integration

After identifying the order of integration in time series data, researchers can be applied for co-integration test if all the variables in a multivariate model are stationary only after differencing or integrated of the same order, say *I(1)*. Co-integration or long-run equilibrium relationship must exist between two non stationary time series fat if the following two conditions fulfill (Thome, 2014).

First, order of integration must be same for each of the two series.

Second, linear combination between the series is *I (0)* i.e. stationary at their levels.

In order to check long run equilibrium relationship (co-integrations) among the variables this paper used the maximum likelihood procedure introduced by Johansen (1988) and Johansen and Juselius (1990). Johansen (1988) suggested two likelihood ratio test statistics to determine the number of co-integrating vectors: the Maximum eigenvalue test and the trace test

Maximum Eigenvalue Test:

The maximum eigenvalue test statistic is:

$$\pi (r_0, r_0 + 1) = -T \ln (1 - \lambda_{r0+1}) \quad (5)$$

Where, T is the sample size, null hypothesis H_0: Co integrating vectors $(\Pi) = r_0$ and alternative hypothesis H_1: Co integrating vectors $(\Pi) = r_0 + 1$. For instance, null hypothesis of $(\Pi) = 0$ is tested against the alternative hypothesis $(\Pi) = 1$ by the likelihood ratio test statistic $\pi (0, 1) = -T \ln (1 - \lambda_1)$.

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Trace Test:

The trace test statistics is:

$$LR\,(r_o, n) = -T \sum_{i=r_0+1}^{n} \ln(1-\lambda_i) \qquad (6)$$

Where, T is the sample size and LR (r_0, n) is the likelihood ratio statistic for testing whether rank (Π) = r against the alternative hypothesis that rank (Π) ≤ n. For instance the null hypothesis of co-integrating vectors r = 0 (none) is tested against the alternative hypothesis of r_0 < rank (Π) ≤ n, where n represents maximum number of possible co-integrating vectors. On the condition of rejecting null hypothesis, the successive test consider the null hypothesis of co-integrating equation r_0 + 1 against the alternative hypothesis of r_0 + 1 < rank (Π) ≤ n (Dwyer, 2015).

Granger-Causality Test

On one hand, if long-run equilibrium relationship (co-integration) exists among time series data, it is required to examine the dynamic relationship involving variables within VECM framework. On the other hand, in case of no co-integration Granger causality test could be used directly without VECM. This study has considered the following six variables VECM framework with one co-integrated relationship.

$$\Delta GDP_t = \delta_{11} + \sum_{i=1}^{n} \delta_{12}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{13}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{14}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{15}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{16}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{17}\Delta INF_{t-i} + \delta_{18}ECT_{t-1} + \vartheta_t \qquad (7)$$

$$\Delta DCP_t = \delta_{21} + \sum_{i=1}^{n} \delta_{22}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{23}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{24}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{25}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{26}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{27}\Delta INF_{t-i} + \delta_{28}ECT_{t-1} + \vartheta_t \qquad (8)$$

$$\Delta BM_t = \delta_{31} + \sum_{i=1}^{n} \delta_{32}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{33}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{34}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{35}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{36}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{37}\Delta INF_{t-i} + \delta_{38}ECT_{t-1} + \vartheta_t \qquad (9)$$

$$\Delta GDS_t = \delta_{41} + \sum_{i=1}^{n} \delta_{42}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{43}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{44}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{45}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{46}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{47}\Delta INF_{t-i} + \delta_{48}ECT_{t-1} + \vartheta_t \qquad (10)$$

$$\Delta GCF_t = \delta_{51} + \sum_{i=1}^{n} \delta_{52}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{53}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{54}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{55}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{56}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{57}\Delta INF_{t-i} + \delta_{58}ECT_{t-1} + \vartheta_t \qquad (11)$$

$$\Delta INF_t = \delta_{61} + \sum_{i=1}^{n} \delta_{62}\Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_{63}\Delta DCP_{t-i} + \sum_{i=1}^{n} \delta_{64}\Delta BM_{t-i} + \sum_{i=1}^{n} \delta_{65}\Delta GDS_{t-i} + \sum_{i=1}^{n} \delta_{66}\Delta GCF_{t-i} + \sum_{i=1}^{n} \delta_{67}\Delta INF_{t-i} + \delta_{68}ECT_{t-1} + \vartheta_t \qquad (12)$$

Where, ECT_{t-i} is the lagged one period error correction term (ECT) while ϑ_t is the error term assumed to be normally distributed with mean zero and constant variance i.e. ϑ_t N (μ,σ^2).

The direction and speed of adjustments in the dependent variable to deviations from the linear long run relationship can be identified by examining the coefficient of the ECT i.e. $\delta_{18}, \delta_{28}, \delta_{38}\ \delta_{48}, \delta_{58}\ \delta_{68}$. Thus, the negative and significant higher value of coefficient of the ECT describe the greater speed of adjustment between the dependent and independent variables towards their respective long term equilibrium while the lagged change in independent variables represent the short run causal impact (Gounder, 2012).

4. EMPIRICAL RESULT AND DISCUSSION

4.1. Descriptive Statistics

Table 1 presents descriptive statistics of the research variables used in this study. From the table it is easy to identify all the variables are normally distributed except inflation and out of six variables; three variables (GDP,

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GDS, and GCF) are negatively skewed. Kurtosis indicates the peakedness of the distribution. Most of the variables are platykurtic while GDP is mesokurtic and inflation is leptokurtic in nature.

Table-1. Descriptive Statistics for the variables

	GDP	DCP	BM	GDS	GCF	INF
Mean	4.9225	22.3474	34.5072	14.3088	20.9782	7.4516
Median	5.0612	20.2416	27.0588	15.2991	21.2730	6.7460
Maximum	7.2339	44.4487	65.8750	24.9977	29.6525	25.6188
Minimum	0.8191	4.5340	13.3864	1.5152	11.2038	-3.2101
Std. Dev.	1.5058	12.5240	17.3286	6.5096	5.4395	5.2662
Skewness	-0.5351	0.4196	0.4849	-0.3803	-0.0683	1.4142
Kurtosis	2.9590	2.0106	1.7727	1.9190	1.7420	5.8848
Jarque-Bera	1.9123	2.8057	4.0780	2.9118	2.6685	27.2038
Probability	0.3843	0.2458	0.1301	0.2331	0.2633	0.0000

Source: Author's Estimation using Eviews 7.2

4.2. Stationary Test

The results of stationary test are reported in Table-2. According to Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests this study identified all the variables used in the regression model has unit root at level i. e. non-stationary while ADF and Phillips-Perron (PP) test suggests inflation as a non-stationary time series only considering 5% level of significance and 1% level of significance respectively. In addition to the results of both test reveal that all the variable are stationary at first difference i.e. integrated of order 1; *I(d)*.

Table-3 indicates lag two as an optimal lag length selecting by three criterions out of five. Moreover, Akaike information criterion (AIC) has superior properties and provide efficient results compared to: Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ). For further analysis this paper used lag 2.

Table-2. Unit root test

Variables	At level		1st Difference		Remarks
	ADF	PP	ADF	PP	*I(d)*
GDP	-0.271 (0.5817)	-0.013 (0.6724)	-12.634 (0.0000)***	-12.633 (0.0000)***	*I(1)*
DCP	-1.837 (0.6673)	-1.853 (0.6593)	-5.962 (0.0001)***	-6.211 (0.0000)***	*I(1)*
BM	-1.953 (0.6075)	-1.946 (0.6114)	-4.811 (0.0021)***	-4.662 (0.0032)***	*I(1)*
GDS	-3.099 (0.1206)	-3.194 (0.1004)	-7.490 (0.0000)***	-11.069 (0.0000)***	*I(1)*
GCF	-3.2342 (0.0931)	-2.349 (0.3990)	-4.2319 (0.0097)***	-3.985 (0.0178)**	*I(1)*
INF	-1.841 (0.0631)	-2.145 (0.0324)	-15.228 (0.0000)***	-20.929 (0.0000)***	*I(1)*

Note 1: * Rejection of null hypothesis of unit root at the 10% level.
Note 2: ** Rejection of null hypothesis of unit root at the 5% level.
Note 3: *** Rejection of null hypothesis of unit root at the 1% level.
Note 4: P-values are in parenthesis.
Note 5: *I(d)* denotes order of integration.

4.3. Johansen Co-Integration Test

Since all the variables used in regression model are integrated of order I(1), this paper used Johansen co-integration test in order to investigate the long-run equilibrium relation among them. The empirical results of table 4 shows that (in both tests) there is one co-integrating equation exist which reveals the presence of long-run co-movements among the variables. As shown in the table, in both tests i.e. Trace Test and Maximum-Eigenvalue test, P-value is less than 5% level of significance, so we can reject the null hypothesis of no co-integrating equation.

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Table-3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-536.7983	NA	102861.7	28.56833	28.82690	28.66033
1	-365.4669	279.5406	85.10535	21.44563	23.25559*	22.08960*
2	-322.4487	56.60292*	68.13019*	21.07625*	24.43761	22.27219

Note 1: * indicates lag order selected by the criterion
Note 2: LR: sequential modified LR test statistic (each test at 5% level)
Note 3: FPE: Final prediction error
Note 4: AIC: Akaike information criterion
Note 5: SC: Schwarz information criterion
Note 6: HQ: Hannan-Quinn information criterion

Table-4. Johansen test for Co-integration

Hypothesized No. of CE(s)	Eigenvalue	*Trace Test*			*Maximum-Eigenvalue test*		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.725397	106.5990	95.75366	0.0073	47.81989	40.07757	0.0056
At most 1	0.480783	58.77909	69.81889	0.2748	24.25104	33.87687	0.4374
At most 2	0.385390	34.52805	47.85613	0.4732	18.01037	27.58434	0.4943
At most 3	0.208341	16.51768	29.79707	0.6754	8.644126	21.13162	0.8600
At most 4	0.188526	7.873550	15.49471	0.4790	7.729413	14.26460	0.4069
At most 5	0.003888	0.144136	3.841466	0.7042	0.144136	3.841466	0.7042

Note 1: Both, Trace and Maximum-Eigenvalue, test indicate 1 cointegrating eqn(s) at the 0.05 level
Note 2: * denotes rejection of the hypothesis at the 0.05 level
Note 3: **MacKinnon *et al.* (1999) p-values
Note 4: Lags interval (in first differences): 1 to 2
Note 5: Trend assumption: Linear deterministic trend

4.4. Granger Causality using VECM

As the study has identified the existence of long-run equilibrium relation between variables under consideration, the use of unrestricted VAR model might produce misleading results. Meanwhile it is possible to exists deviations in short-run from this long-run equilibrium. Thus, to testify the rate of convergence of such disequilibrium to the long-run equilibrium as well as to determine granger cause of financial development on GDP and other macroeconomic variables and vice versa this paper used Vector Error Correction Mechanism (VECM)

According to Engle and Granger (1987) a comprehensive test (popular by the name of error correction model) of causality should be adopted by the researchers, if two variables are co-integrated. The VECM structure impose restriction of long-term behavior among the endogenous variables to correct disequilibrium in each period to co-integrating relationships while permit a extensive range of short-run dynamics. The coefficient of co-integrating term, known as error correction term(ECT) indicates the speed of adjustment between the variables towards their respective long-term equilibrium. The coefficient of ECT should be statistically significant and negative sign. Furthermore, a negative and significant co-efficient of ECT confirms the presence of stable long run relationship between variables.

Table 5 shows the results of VECM to examine the stable long-run equilibrium relationship and short-run dynamics between the variables. The study has found the significant long-run causality from financial development to economic growth. The significant and negative ECT= −0.438364 imply that deviation from the long-term growth rate in GDP is corrected by 43.84% by the next period. Also the table reveals the significant causality running from GDP to BM which implies the existence of bilateral long-run causality between GDP and BM. In the sort-run, there exists a unidirectional causality running from GDP to DCP meaning that economic growth fosters the credit circulation in private sector. This paper also found unidirectional causality from BM to DCP, GDP to INF and DCP to INF. Furthermore, feedback causal relationship found between GDP and GCF. Significant feedback also exists between GDS and GCF.

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Table-5. Granger Causality using VECM

Variables	1	2	3	4	5	6
Error Correction:	**ΔGDP**	**Δ DCP**	**Δ BM**	**Δ GDS**	**Δ GCF**	**Δ INF**
ECT(-1)	-0.438364 [-2.54840]**	-0.302755 [-1.39052]	-0.658186 [-1.83897]*	0.098826 [0.48622]	0.236197 [2.34690]**	-0.701438 [-1.48880]
Δ GDP(-1)	-0.636782 [-4.26251]*□*	-0.140042 [-0.74060]	0.179775 [0.57836]	-0.167619 [-0.94957]	-0.176410 [-2.01829]*	0.970111 [2.37089]**
Δ GDP(-2)	-0.325867 [-2.30520]**	-0.325690 [-1.82023]*	0.095978 [0.32631]	0.070393 [0.42143]	-0.058449 [-0.70669]	0.545673 [1.40934]
Δ DC□(-1)	0.196535 [1.23693]	-0.137798 [-0.68518]	-0.431986 [-1.30668]	-0.112990 [-0.60183]	0.001711 [0.01840]	1.551936 [3.56611]***
Δ DCP(-2)	0.242934 [1.25803]	0.324622 [1.32811]	0.270457 [0.67312]	-0.001872 [-0.00821]	-0.245690 [-2.17458]**	-0.828047 [-1.56557]
Δ BM(-1)	-0.169764 [-1.36287]	0.218369 [1.38502]	0.141171 [0.54469]	0.035174 [0.23898]	0.016601 [0.22779]	-0.298977 [-0.87632]
Δ BM(-2)	-0.196955 [-1.56324]	-0.310385 [-1.94632]*	-0.248775 [-0.94898]	-0.050231 [-0.33741]	0.128163 [1.73864]*	0.418534 [1.21285]
Δ GDS(-1)	0.335702 [1.49363]	-0.057598 [-0.20247]	0.240773 [0.51486]	-0.346749 [-1.30568]	-0.271351 [-2.06351]*	-0.605344 [-0.98334]
Δ GDS(-2)	0.128219 [0.72767]	-0.129821 [-0.58208]	-0.305663 [-0.83371]	-0.122808 [-0.58985]	-0.201762 [-1.95707]*	0.338084 [0.□0052]
Δ GCF(-1)	0.188854 [0.69090]	-0.574958 [-1.66181]	-0.654829 [-1.15137]	1.168858 [3.61897]***	0.635294 [3.97241]***	0.160790 [0.21477]
Δ GCF(-2)	-0.753123 [-2.25601]**	0.387388 [0.91680]	0.122733 [0.17670]	-0.372484 [-0.94431]	0.108345 [0.55471]	-1.010552 [-1.10522]
Δ INF(-1)	0.096936 [1.25802]	0.086494 [0.88683]	0.074686 [0.46584]	-0.004248 [-0.04666]	-0.024299 [-0.53898]	-0.174380 [-0.82625]
Δ INF(-2)	-0.024487 [-0.50148]	0.037454 [0.60601]	-0.006444 [-0.06343]	-0.043143 [-□.74776]	-0.001891 [-0.06619]	0.157330 [1.17638]
C	0.198390 [0.53491]	1.218531 [2.59565]**	2.005455 [2.59873]**	0.636817 [1.45312]	0.434174 [2.00081]*	-0.687730 [-0.67700]
Diagnostic test						
D-W stat	1.908059	2.094406	1.966211	1.824323	1.339804	2.050537
LM	0.248725 (0.8831)	0.642122 (0.7254)	0.989338 (0.6098)	0.422711 (0.8095)	10.42392 (0.0055)***	0.691808 (0.7076)
Het	0.083673 (0.7724)	0.440339 (0.5070)	0.191530 (0.6616)	0.532094 (0.4657)	0.258392 (0.6112)	1.317498 (0.2510)

Note 1: * 10% level of significance
Note 2: ** 5% level of significance
Note 3: *** 1% level of significance
Note 4: t-statistics in [] and p-values in ().
Note 5: D-W means Durbin-Watson stat. LM is the Breusch-Godfrey Serial Correlation LM Test. Het is the ARCH test for Heteroskedasticity

Table-6. Variance Decomposition of GDP and Financial development

a. Variance Decomposition of GDP:

Period	S.E.	GDP	DCP	BM	GDS	GCF	INF
1	1.004968	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.130265	81.69481	0.513288	0.684131	3.237332	8.583443	5.286998
3	1.238200	79.68001	0.795150	1.836399	3.568936	8.066538	6.052968
4	1.381848	80.71923	0.857051	2.315069	2.867985	7.656118	5.584546
5	1.489737	77.37252	0.953168	3.573636	3.821728	7.755850	6.523098
6	1.573925	78.46685	0.880970	3.266903	3.621740	7.512601	6.250939
7	1.653436	78.89495	0.844341	3.166248	3.314903	7.349535	6.430022
8	1.726202	79.77352	0.787216	2.966268	3.064246	7.030073	6.378678
9	1.795212	80.02183	0.769518	2.797813	2.860300	6.951145	6.599395
10	1.863327	80.53396	0.729834	2.669060	2.670965	6.705485	6.690697

b. Variance Decomposition of DCP:

Period	S.E.	GDP	DCP	BM	GDS	GCF	INF
1	1.272033	14.81736	85.18264	0.000000	0.000000	0.000000	0.000000
2	2.125086	27.20314	63.27625	6.957682	1.648112	0.496003	0.418815
3	2.726273	29.44562	59.44818	5.364168	3.097705	0.604149	2.040182

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4	3.149112	27.41139	59.69253	5.907203	3.931900	0.453556	2.603424
5	3.581528	27.32952	58.70438	6.273670	3.793558	1.035266	2.863606
6	3.961790	26.34237	58.47465	6.634279	4.632047	1.289616	2.627034
7	4.307350	25.46805	58.02065	7.208552	5.377959	1.559614	2.365172
8	4.619565	25.25627	57.93458	7.337420	5.678406	1.588984	2.204344
9	4.912998	25.03608	57.60263	7.689888	6.009810	1.556217	2.105372
10	5.182628	24.90312	57.43231	7.884686	6.156825	1.528608	2.094453

c. Variance Decomposition of BM:

Period	S.E.	GDP	DCP	BM	GDS	GCF	INF
1	2.091027	8.826154	8.604948	82.56890	0.000000	0.000000	0.000000
2	3.466853	7.520576	3.585259	86.39285	0.029562	0.024450	2.447304
3	4.374790	5.131575	2.272649	86.59865	0.491749	0.021515	5.483856
4	5.207877	3.647563	1.608638	87.29236	0.470908	0.283506	6.697022
5	5.958331	2.860545	1.239566	87.78047	0.393631	0.884392	6.841396
6	6.614299	2.323775	1.009030	88.43067	0.486177	1.241149	6.509201
7	7.199620	1.967769	0.855955	89.02835	0.555065	1.400921	6.191942
8	7.721054	1.735868	0.747898	89.50603	0.573973	1.383430	6.052803
9	8.221944	1.548557	0.667335	89.87152	0.579647	1.325409	6.007535
10	8.691010	1.401832	0.604906	90.07547	0.561774	1.293604	6.062414

Source: Author's Estimation using Eviews 7.2

Variance decomposition of GDP and Financial Development results are reported in table 6.a, b, c. the variance decomposition model helps to portray additional insight into the regression model regarding the variance relations between the dependent and independent variables. The results of table 6. (a) show that most of the variance of GDP has responded by the shock to itself in both short run and long run. On the other hand, in the short-run, say period 2, shock to DCP and BM can fluctuate GDP only 0.51% and 0.68% respectively. But, in the long run, GDP has explained by DCP and BM with the increasing value of 0.73% and 2.67% respectively. Table 6. (b) reveals that most of the variance of DCP are explained by the impulse to itself i.e. DCP and GDP. In period 10, it can be seen that shock to GDP account for 24.90% and shock to DCP account for 57.43% fluctuation in DCP. Furthermore table 6.(c) identifies that in period 2, BM is explained by 7.52% of GDP and 3.59% of DCP and 86.39% by itself. At the period 10, the accountability of GDP and DCP for fluctuating BM has decreased to 1.40% and 0.60% respectively while the accountability of BM (own shock) for fluctuating BM has increased to 90.08%.

The results consent our prior findings that financial development has a long run equilibrium association with GDP.

4.5. Diagnostic and Stability Test

The results of diagnostic test are reported in table 5. It shows that all the models (except model 5) in VECM framework are free from serial correlation problem. Also there is no evidence of heteroscedasticity in each of the six models specified. This paper applied Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) to testify the stability of the coefficients of error correction model in each of the specifications. Figure 2 & 3 represent CUSUM and CUSUMSQ statistic plot at 5% significance level for coefficient stability of ECM model 1 where, Economic growth (GDP) is considered as a dependent variable and financial development, savings, investment and inflation considered as independent variables. The test line in Figure 2 & 3 of CUSUM and CUSUMSQ are within the critical boundaries at 5% significance level implying that the coefficients of the model 1 are stable.

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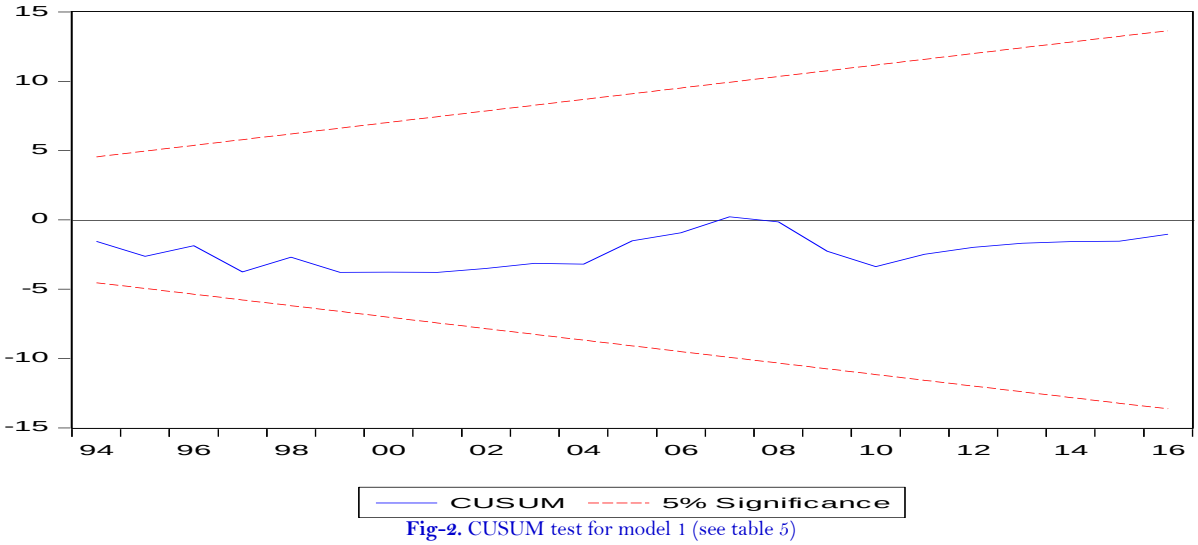

Fig-2. CUSUM test for model 1 (see table 5)

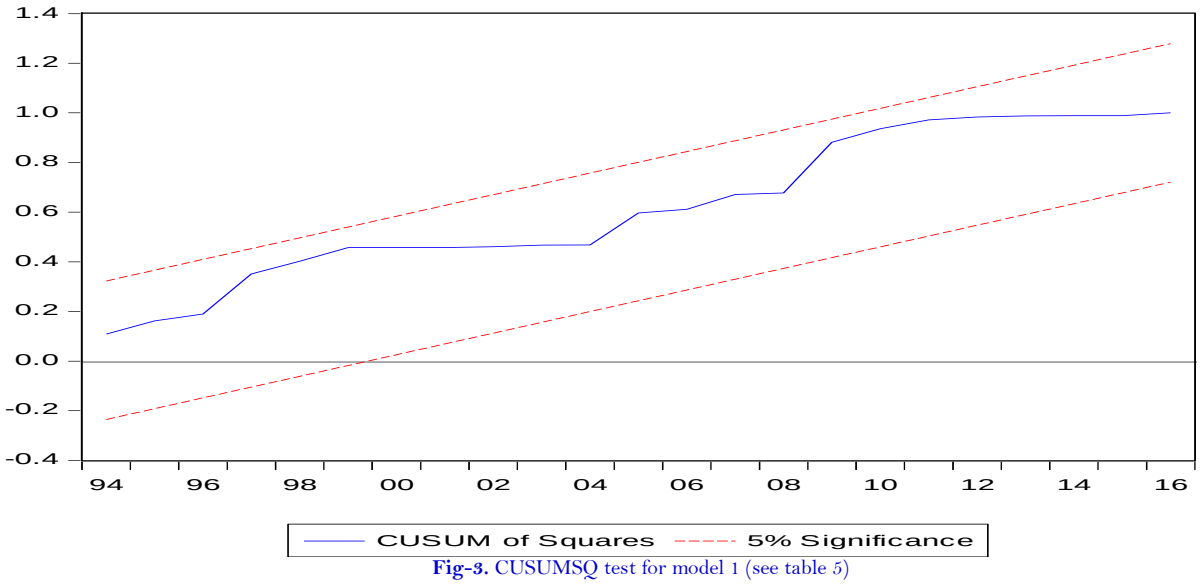

Fig-3. CUSUMSQ test for model 1 (see table 5)

5. CONCLUDING REMARKS

In theories, it is widely acknowledged by economists that financial development fosters a country's economic growth especially developing countries. Assumptions of the impact of financial development on economic growth imply that with efficient monetary policy , the greater the credit circulation and money supply to private sectors by financial corporations and institutions the higher the economic growth of a country. On the basis of these assumptions this paper used Domestic Credit to Private Sector (DCP) and Broad Money (BM) as proxy variables for financial development and GDP for economic growth. In addition, this paper used some macroeconomic control variables namely GDS, GCF, INF to capture their effect on economic growth while considering financial development. The study covers the period of 1977-2016. The main focus of this study is to find out the effect of financial development on economic growth in case of Bangladesh. As the times series data of the variables under consideration have found non-stationary and co-integrated, the VECM frame work has been adopted. The results of VECM reveal that there is a long-run positive relationship between financial development and economic growth. Moreover savings (GDS) and investment (GDC) have long run positive relationship with GDP growth rate of Bangladesh while inflation has negative long-run association with GDP. In short-run very few evidence has been found the dynamic relationship among the variables.

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Though the results of the study show the positive impact of financial development on economic growth of Bangladesh, substantial reforms must be needed on the structure of financial system in Bangladesh particularly semiformal and informal financial sector. Institutions which are regulated by others controlling authorities but do not fall under the jurisdiction of Central Bank are called semi-formal sector while informal financial sector is completely unregulated. The study suggests government of Bangladesh focusing on efficient monetary policy to control interest and inflation at stable rate. Besides credit circulation and money supply to countries economy should monitor with utmost care.

This study is basically based on secondary time series data of single country. There is a wide scope to investigate the relationship between financial development and economic growth using cross sectional and panel data. Moreover, this research can be extended by adding primary data of financial sectors reform and corporate administration of financial institutions.

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