

The Relationship between Financial Development and Economic Growth in Bangladesh: An ARDL approach

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Abstract

In recent years, the effect of financial development on economic growth has been paying attention by policy makers and researchers all over the world due to the development and expansion of financial institution and market. A sound and the robust financial system can accumulate capital from various sources and allocate the capital resources to most productive sector effectively. This study examines the pivotal relationship between the financial development and economic growth in Bangladesh using the autoregressive distributed lag (ARDL) approach over the period from 1977 to 2015. Empirical analysis observe the effect of financial development and economic growth through some regression models, concludes that the financial indicators namely domestic credit to private sector by banks (CPS) to gross domestic product (GDP), money supply (M2) to GDP, and stock market capitalization (MC) to GDP has a statistically significant positive effect on GDP per capita. Among these three financial development indicators, money supply has relatively higher and stock market capitalization has a lower significant effect on GDP. ARDL model used to determine the short-run and the long-run relationship among the variables. Bounds test conferred the cointegration or long run relationship between study variables and the long-run co-efficient of domestic credit to private sector by the bank is seemed have statistically positive significant contribution but the long run coefficient of money supply is appeared to be statistically insignificant. In short run, there is a causality running from financial development (domestic credit to private sector by depository banks (CPS) as a percentage of GDP, broad money (M2) as a percentage of GDP, stock market capitalization (MC) as a percentage of GDP) to economic growth.

Keywords: Financial Development, Economic Growth, ARDL model, Bounds Test.

JEL Classification: C13, C22, C32

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Background of the Study

Economic growth of a country is mainly determined by many factors, the financial sector is one of them. Over the past few decades, the world stock markets have surged, and emerging markets have accounted for a large amount of this boom. A robust and proficient financial system consists of financial intermediaries and financial markets enhance economic growth through capital accumulation, effective use and allocation of capital resources to most productive sectors, boosting the savings and investment rate. According to Levin (1997, 2005) the five key functions of financial system which promote economic growth of a country are (i) produce ex-ante information about possible investments and capital allocation; (ii) monitoring investments and delivering corporate governance after providing financing; (iii) facilitation of trade, diversification and management of risk; (iv) mobilization and pooling savings; and (v) promoting the exchange of goods and services. Financial institutions like commercial banks, stock markets can acquire and produce efficient information about intermediation of savings into potential investments and capital allocation. Capital allocation involves dividing financial resources and capital to the different productive sector. Financial institutions can also support the small and medium enterprises (SMEs). They are labor intensive and create more jobs than big companies which significantly influence the economic growth of a country like Bangladesh.

This study primarily focuses on studying and establishing a statistical relationship between financial development and economic growth in Bangladesh. However, in practice, there is no absolute measurement of financial development due to complexity and dimensions it encompasses. Empirical work done so far is usually based on standard quantitative indicators like the ratio of financial institution's asset to GDP, the ratio of liquid liabilities to GDP, the ratio of deposits to GDP, the ratio of Private sector credit to GDP (World Bank, 2015). In this study GDP (nominal) is used as a proxy variable in terms of economic growth.

The main **objectives** of the study are to investigate the statistical relationship between financial development and economic growth in Bangladesh. Extensively, determine the direction of the relationship, the positive or negative effect of financial development on economic growth as well as the degree of relationship.

Another objective is to examine the existence of short-run & long-run relationship through auto regressive distributed lag model.

The rest of the article is organized as follows. In section 2 the literature review, in section 3 an overview of financial system of Bangladesh, in section 4 data and methodology, in section 5 empirical analysis and results discussion and in the last section conclusion.

Literatures Review

The relationship between financial development and economic growth is a controversial topic. According to Bagehot (1873) and Hicks (1969), financial development had an important role in the industrialization period of England by mobilizing capital.

Schumpeter (1912) concludes that financial development has an important effect on economic growth. Financial intermediaries support innovation and creativity and there by economic growth by identifying and funding productive investments.

Goldsmith (1969) shows the existence of a positive relationship between financial development and economic growth. King and Levine (1993) use the data for 77 countries over the period from 1960 to 1989 to investigate the relation between financial indicator liquid liabilities and Economic growth and find a statistically significant positive relationship between financial development and economic growth.

Levine and Zervos (1998) find a statistically significant relation between banking development and the stock market with productivity growth by using 47 countries from 1976 to 1993. Beck and Levine (2004) notice the financial institutions measured by stock markets and banks have a significant effect on economic growth by using 40 countries from 1976 to 1998.

Levine, Loayza, and Beck (2000) observe a robust legal origin promote better financial institutions and thereby promote economic growth. They use data for 74 countries from 1960 to 1995.

Godfrey Ndlovu (2013) finds the existence of unidirectional causality from economic growth to financial development in Zimbabwe for the period 1980-2006.

Islam, Habib, and Khan (2004) find no evidence of causal direction from financial development to economic growth in Bangladesh, rather growth led financial development for the period 1975-2002.

Md. Habibur Rahman (2007) shows that financial development in Bangladesh has long run effect on income per capita for the period 1976-2005.

Mohsin and Abdelhek (2000) find strong positive and statistically significant relationship between financial indicators such as domestic credit to the private sector, stock market capitalization and economic growth by using data for 159 countries for the period 1960-1999. There is a few empirical evidences does not support the positive statistically significant relationship between financial development and economic growth.

According to Shakhawat (2018), for some MENA countries inflation rate, domestic credit to private sector and broad money have negative impact on GDP growth that might be due to high inflation rates and less stable economies.

According to Van Wijnberg (1983) and Buffie (1984), financial development is anti-growth. Lucas (1988) concludes that finance is an overstressed determinant of economic growth. Therefore, any policies aimed at endorsing financial development would be a waste of resources, as it diverts attention from more relevant policies such as labor and productivity improvement programs, encouragement of exports; amongst others.

Md. Rabiul Islam, Md. Wahidul Habib and Md. Habib-uz-Zaman Khan (2004) find that there is no such evidence of causal direction from financial development to economic growth in Bangladesh. Despite having contradictory empirical evidence on the relationship between financial development and economic growth, it is generally agreed that a robust and sound financial system have a positive impact on economic growth (Apergis, Filippidis, and Economidou, 2007; Jung, 1986; Calderon and Liu, 2003). According to World Bank, financial development plays an important role in economic growth; it reduces poverty by providing access to financing to the poor and improves in income distribution (World Bank, 2001).

Shakhawat (2018) found the inflation rate; import and credit by banking sector for some Latin American countries have negative impact on GDP growth whereas the

rest of the variables, exports, stock market, board money, credit by private sector and interest rate have positive contribution to the GDP growth where only interest and credit by banking sector are significant.

Overview of Financial System of Bangladesh

The financial system of Bangladesh largely consists of Banks, Non-Bank Financial Institution (FIs), Insurance Companies, Capital Market, Micro Finance Institutions (MFIs). These institutions are a part of the formal sector of the financial system of Bangladesh. Banks and Non-Bank Financial Institution (FIs) are regulated by Bangladesh Bank.

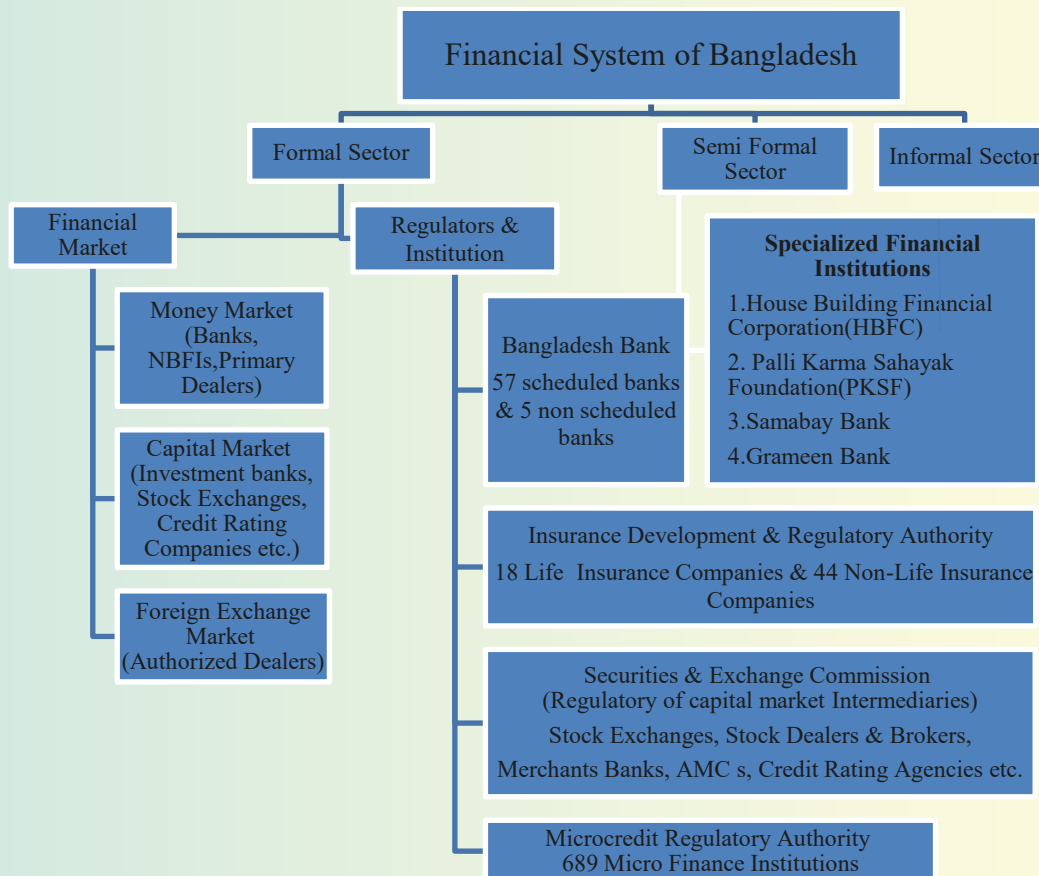
Specialized financial institutions which are regulated but do not fall under the full jurisdiction of Bangladesh Bank are the part of the semi-formal sector. The informal sector includes those private financial institutions which are not completely regulated by any other financial regulator are the part of the informal sector.

Bangladesh Stock Market

Bangladesh has two stock markets, Dhaka Stock Exchange (DSE), established in 1954 where trading is conducted by computerized Automated Trading System and Chittagong Stock Exchange (CSE), established in 1995 which is also conducted by computerized Automated Trading System.

The Dhaka Stock Exchange (DSE) was established as East Pakistan Stock Exchange Association Limited on April 28, 1954. Formal trading of the bourse began in 1956. On June 23, 1962, it was renamed as East Pakistan Stock Exchange Ltd. The name of the stock exchange was once again changed to Dacca Stock Exchange Ltd on May 13, 1964. The service on the stock change continued uninterrupted until 1971. The trading was suspended during the liberation war and resumed in 1976 with the change in economic policy of the government.

Figure 1: Structure of Financial System of Bangladesh



Source: Bangladesh Bank Website.

The Chittagong Stock Exchange (CSE) is a not-for-profit organization, formed and registered with the registrar Joint Stock Companies and Firms in Bangladesh on April 1, 1995 as a public company limited by guarantee with an Authorized capital of 150,000,000 divided into 500 shares of Tk. 300,000 each. The Exchange members are not its beneficiaries since they are not involved in profit sharing and taking dividend.

Data and Methodology

Data

In this study, data is collected from the World Bank Development Indicator online database for Bangladesh. Gross Domestic Product (GDP) per capita at current US dollar over the period from 1977 to 2015 is considered in this study as it is calculated without making deductions for depreciation of fabricated assets or for depletion or degradation of natural resources. Financial development is measured by three widely used financial development indicator. Firstly, domestic credit to private sector by depository bank (CPS) as a percentage of GDP is one of the popular and best used financial development indicators. It refers to financial resources provided to private sector by depository banks except for central bank. Generally, it excludes credit issued to government, government agencies, and public agencies. But for some countries, these claims include credit to public enterprises. Secondly, broad money (M2) as a percentage of GDP is the liquid liabilities of the financial system in Bangladesh consisting of currency plus demand and interest-bearing liabilities of banks and non-banks financial intermediaries. This is the broadest measure of financial intermediation as it covers all banks, central bank, and non-financial intermediary activities. Finally, for the stock market, a commonly used proxy variable is stock market capitalization (SMC) as a percentage of GDP which represents the financial market. Market capitalization is the share price times the numbers of shares outstanding of listed companies

The variables GDP per capita (from 1977 to 2015), domestic credit to private sector by depository banks (CPS) as a percentage of GDP (from 1977 to 2015), broad money (M2) as a percentage of GDP (from 1977 to 2015), stock market capitalization (MC) as a percentage of GDP (from 1993 to 2012), are converted to natural logarithm and represented by $\ln\text{GDP}$, $\ln\text{CPS}$, $\ln\text{M2}$, and $\ln\text{MC}$ respectively. Due to non-availability of data, the dataset of Stock market capitalization ranges from 1993 to 2012 was used. (The dataset I have used from world bank excel sheet is providing stock market data for Bangladesh after 1993).

Methodology

Primarily, to investigate the relationship between economic growth and financial development, a series of the linear regression model is performed by using $\ln GDP$ as the dependent variable; $\ln CPS$, $\ln M2$, $\ln MC$ as the independent variable. First, individual financial development indicator is regressed to the dependent variable, GDP per capita.

$$\ln GDP = \alpha + \alpha_1 \ln CPS + u_1 \dots \dots \dots (4.1)$$

$$\ln GDP = \beta + \beta_1 \ln M2 + u_2 \dots \dots \dots (4.2)$$

$$\ln GDP = \gamma + \gamma_1 \ln MC + u_3 \dots \dots \dots (4.3)$$

α , β , and γ are the intercept or constant of their respected model, α_1 , β_1 , and γ_1 are the regression coefficients of $\ln CPS$, $\ln M2$, $\ln MC$ and u_1 , u_2 , and u_3 are the error term of the model.

Then a model is estimated by including all independent variables except stock market capitalization due to non-availability of data set (1993 to 2012).

$$\ln GDP = \delta + \delta_1 \ln CPS + \delta_2 \ln M2 + u_4 \dots \dots \dots (4.4)$$

δ is the intercept or constant of the model, δ_1 and δ_2 are the regression coefficients of $\ln Cps$ and $\ln M2$ and u_4 is the error term of the model.

Autoregressive Distributed Lag (ARDL) model has been used for examining the long run relationship and the cointegrating relationship between variables (Pesaran and Shin, 1999). It includes lagged variable of both dependent variable and independent variable as regressors (Greene, 2008). When sample size is small, the ARDL model is more efficient than traditional Johanson cointegration as it requires a large sample. So ARDL model has been used in this analysis for examining the long run and short run relationship between $\ln GDP$ and $\ln CPS$ and $\ln M2$. But before going to ARDL approach, unit root test has to be performed. Because one of the vital assumptions of ARDL model is that ARDL model can be used in the presence of a mixture of $I(0)$ and $I(1)$ series but cannot be used in the presence of $I(2)$ series (Paul, 2014). Unit root or order of integration of variables is tested by Dickey-Fuller (DF) test (1979) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (1992). The ARDL approach is a two-step method for estimating long-run relationship (Pesaran et al., 2001). The first step involves

examining the existence of a long-run relationship between dependent variable and independent variable in the ARDL model. And the second step involves estimating the coefficient of the same ARDL model.

Now the basic form of $ARDL(p, q_1, \dots, q_k)$ model in terms of $\ln GDP$, $\ln CPS$, and $\ln M2$. The $ARDL(p, q_1, q_2)$ model is

$$\ln GDP_t = \alpha + \sum_{i=1}^p \gamma_i \ln GDP_{t-i} + \sum_{i=0}^{q_1} \beta_i \ln CPS_{t-i} + \sum_{i=0}^{q_2} \delta_i \ln M2_{t-i} + \varepsilon_t \dots \dots \dots (4.5)$$

Where p is the number of lags of $\ln GDP$, q_1 is the number of lags of $\ln CPS$ and q_2 is the number of lags of $\ln M2$. The lag order of the ARDL model is determined by the lag selection criteria like Akaike Information Criteria (AIC), Schwarz Bayesian Criteria (SBC), Hannan-Quinn Criteria (HQC).

To test the existence of long run coefficient between dependent and explanatory variable, Pesaran, Shin and Smith (2001) provide a method, the Bounds test. Bounds test model for study variables can be represented as

$$\Delta \ln GDP_t = \alpha + \sum_{i=1}^p \gamma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_1-1} \beta_i \Delta \ln CPS_{t-i} + \sum_{i=0}^{q_2-1} \delta_i \Delta \ln M2_{t-i} + \rho GDP_{t-1} + \theta_1 \ln CPS_{t-1} + \theta_2 \ln M2_{t-1} + \varepsilon_t \dots \dots \dots (4.6)$$

The Null Hypothesis is

$$H_0: \theta_1 = \theta_2 = 0; \text{no cointegration among variables.}$$

Here F-Statistic is used in bounds test to test the existence of the long run relationship. Pesaran (2001) computed two sets of asymptotic critical values for bounds test. If the computed F-statistic falls outside the critical value bounds, an inference can be drawn (Pesaran, 2001). The critical values are lower bound critical value which assumes that all variables are $I(0)$ and upper bound critical value which assumes that all variables are $I(1)$. If the calculated F-statistic exceeds the upper bound, the null hypothesis can be rejected; if fall below the lower bound, the null hypothesis can be accepted. If they fall within the bounds, no inference can be made.

Based on the result of Bounds test that is variables are cointegrated or long run relationship exists among the variables, the long run coefficient and Error Correction Model (ECM) along with short-run coefficient can be estimated by the following cointegrating representation of the ARDL model

$$\Delta \ln GDP_t = \sum_{i=1}^{p-1} \gamma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_1-1} \beta_i \Delta \ln CPS_{t-i} + \sum_{i=0}^{q_2-1} \delta_i \Delta \ln M2_{t-i} + \varphi ECT_{t-1} + \epsilon_t \dots \dots (4.7)$$

Where ECT is the error correction term expected to be negative and ranges within 0~1. Otherwise, it will be meaningless. φ is the speed of adjustment. Which describes the degree of disequilibrium are corrected from short-run to long-run when system is out of control. β_i 's and δ_i 's are the short run coefficients describe the short run effect of individual explanatory variable. The long run coefficient of individual variable can be estimated from the model (4.7).

A set of diagnostic tests is performed on selected ARDL model to check the validity and stability of the model. The diagnostic tests are comprised of Breusch-Godfrey serial autocorrelation test, Breusch-Pagan-Godfrey Heteroskedasticity test, Histogram normality test, Ramsey Regression Equation Specification Error test (RESET), cumulative sum (CUSUM) and cumulative sum (CUSUM) of squares test.

Empirical Analysis with Results and Discussion

The relationship between economic growth and financial development is studied through estimating linear regression model (4.1), (4.2), (4.3) and (4.4) including economic growth, financial development indicators. Table 1 illustrates the result of regression model:

Table 1: Estimated results of simple linear regression model

Independent Variable	<i>Dependent variable: lnGDP</i>			
	Model-1	Model-2	Model-3	Model-4
lnCPS	0.770104** (0.0000)			0.228571 (0.2142)
lnM2		0.994872** (0.0000)		0.713619** (0.0037)
lnMC			.297461** (0.0000)	
Constant	3.686747** (0.0000)	2.540748** (0.0000)	5.599328** (0.0000)	2.883270** (0.0000)
Sample	1977-2015	1977-2015	1993-2012	1977-2015
Observations	39	39	20	39
Adjusted R-Squared	0.853428	0.879176	0.616615	0.881100

Note: ** $p < 0.01$, * $p < 0.05$; Note: P-value in parentheses; Source: Authors' estimates

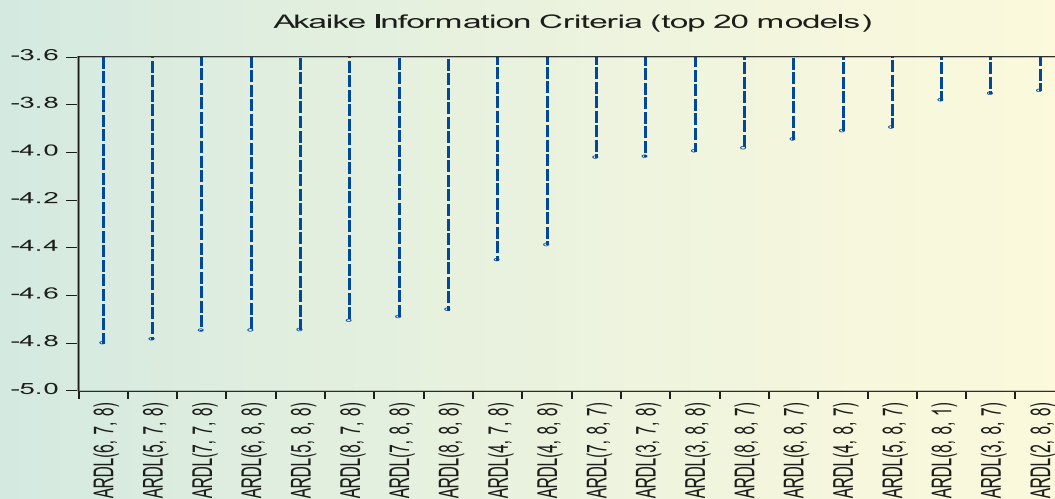
Individually all financial development indicators appear to be positive as well as statistically significant. The direction and magnitude of estimated coefficients is also desirable. But when the bank credit and money supply is used as an explanatory variable, the bank credit appears to be insignificant. Although the financial sector of Bangladesh is mostly dominated by the banking sector, money supply, the measurement of financial depth, appears to have positive and robust significant effect on economic growth than the other two financial development indicators. Stock market capitalization has a relatively lower significant effect on economic growth.

One of the vital assumptions of ARDL model is that ARDL model can be used in the presence of a mixture of $I(0)$ and $I(1)$ series but cannot be used in the presence of $I(2)$ series (Paul, 2014). From table 2, unit root test confirms that all variables are stationary after first difference at 1% and 5% level of significance. These results confirm the further proceed for ARDL method.

Table 2: Unit Root Test

Variable	ADF and KPSS test decision
lnGDP	I(1)
d.lnGDP	I(0)
lnCPS	I(1)
d.lnCPS	I(0)
lnM2	I(1)
d.lnM2	I(0)

The first step of ARDL approach involves determining the appropriate lag order of $ARDL(p, q_1, q_2)$ model variable can be obtained by different selection criteria such as Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC), Hannan-Quinn Criteria (HQC).

Figure 2: ARDL model selection based on AIC criteria

The lower the AIC, SIC, and QIC value, the better the model. Based on this assumption, the appropriate lag order for dependent and independent variables is 8. The selected appropriate ARDL model is **ARDL (6, 7, 8)** which is evaluated from 648 model, automatically done by E-views. Figure 2 exhibits the top 20 models based on AIC criteria and **ARDL (6,7,8)** appears to be best model over the others model.

The existence of a long run relationship or cointegration between study variables is examined by Bounds test. F statistics is used in the bound test which can be estimated by bounds test model (4.6). Table 3 exhibits the results of bounds test.

Table 3: Bounds Test

Test statistics	value	k
F-Statistics	17.92283	2
Critical value bound (Sample Size 30-80)		
Significance	I(0) (lower) bound	I(1) (upper) bound
10%	3.17	4.14
5%	3.79	4.85
1%	5.15	6.36

Since the resulting F statistics at $K = 2$ (where K is the number of independent variable) exceeds the upper critical bound, the null hypothesis of no cointegration is rejected. That means $\ln GDP$, $\ln CPS$, and $\ln M2$ has long run relationship or they are cointegrated. Based on the results of cointegration, the long-run and short-run coefficients is obtained by estimating model (4.7). The long-run model of the $ARDL(6,7,8)$ for GDP is given by

$$\ln GDP = 2.0351 + 1.3259 \ln CPS + 0.0953 \ln M2$$

$$P\text{-Value}(0.0001) \quad (0.0029) \quad (0.7581)$$

It is clear from above model that long run coefficient of credit to private sector by banks has a positive and statistically significant effect on GDP. For 10% change in the private sector credit will result in a long-run change of 13.259% in the GDP. But the long run coefficient of the money supply is positive but statistically insignificant at 5% level of significance. The Error correction term or speed of adjustment associated with short-run coefficients is -0.479245, which is expected and ECT is statistically significant. Which means 47.92% of disequilibrium of the previous year is corrected every year. The Wald test for short-run causality rejects the null hypothesis of no causality running from regressors to the independent variable. Which indicates that there is a short-run causality exists, running from CPS & M2 to GDP. In order to check the stability, misspecification, and some other problems that may arise in terms of time series model, some residuals diagnostic tests and stability test are performed on the $ARDL(6,7,8)$ model. The

residual diagnostic tests are comprised of Breusch-Godfrey serial autocorrelation test, Breusch-Pagan-Godfrey Heteroskedasticity test, Histogram normality test. Stability diagnostic test is consisting of cumulative sum (CUSUM), and Ramsey Regression Equation Specification Error test (RESET).

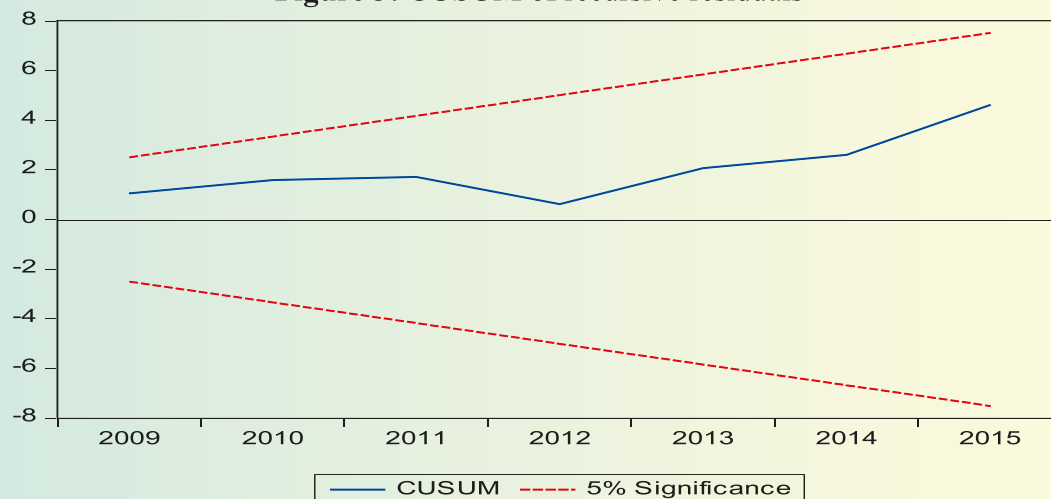
Table 4 reports that residuals are not serially autocorrelated up to order 2, the error variances are constant, and the residuals are normal. Cumulative sum (CUSUM) test is used to test the stability of the parameters of the model.

Table 4: Residuals Diagnostic Test

Residuals Diagnostic Test	P-value	Null Hypothesis
Breusch-Godfrey serial autocorrelation test	0.3451	No Serial correlation in residuals up to specified orders
Breusch-Pagan-Godfrey heteroskedasticity test	0.8899	No heteroskedasticity or error variances are constant
Normality test of residuals	0.0544	Residuals are normal

The theory behind the test is, the parameters are said to be stable if the cumulative sum and cumulative sum of squares fall within the 5% critical lines. CUSUM lines fall within the 5% critical lines. The test indicates the stability in the *ARDL(6,7,8)* model over time.

Figure 3: CUSUM of recursive residuals



RESET test (Ramsey, 1969) is used to examine the non-linear combination of explanatory variables have any power in explaining the response variable, if there is any, the model is not properly specified.

Table 5: RESET test

Test statistics	Value	DF	p-value
<i>t – statistics</i>	0.726428	(6)	0.4949
<i>F – Statistics</i>	0.527698	(1,6)	0.4949

The null hypothesis of RESET test is no functional form misspecification. Both *t – statistics* and *F – Statistics* accept the null hypothesis at 5% level of significance. There is no functional form misspecification in the model. So, the *ARDL(6,7,8)* does not encounter any kind of instability or misspecification error as well as overcome all of the residuals test.

Conclusion

The main objectives of this study are to examine the effect of financial development on economic growth and determine the short-run and long-run relationship between financial development and economic growth in Bangladesh for the period 1977-2015. Several time series econometrics tools are used in this analysis such as linear regression, ADF & KPSS test, bounds test, wald test, and some diagnostic test. The first part of empirical analysis, examine the effect of financial development and economic growth through some regression models, concludes that the financial indicators namely credit to private sector by banks to GDP, money supply (M2) to GDP, and stock market capitalization to GDP have a statistically positive significant effect on GDP per capita. Among three financial development indicators, themoney supply has relatively higher and stock market capitalization has lower significant effect on GDP per capita.

The existence of short-run and the long-run relationship is examined by Autoregressive Distributed Lag model. The bounds test confirms the cointegration or long run relationship between study variables and from ARDL Model we can see that the long-run coefficient of credit to private sector by banks to GDP is statistically significant but the long run coefficient of the money supply (M2) to GDP is not statistically significant.

The error correction term associated with short-run coefficients is statistically significant, that the disequilibrium of the previous year is corrected every year. This study also concludes that there exists a short-run causality running from Private credit and money supply to GDP per capita.

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