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Finding Causality between Finance and Growth in Bangladesh

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Abstract
The relationship between financial development and economic growth has gained much attention in the last three decades. It has been primarily believed that financial sector development promotes economic growth. A lot of theoretical and empirical research has been done in this field and the results which came out are a kind of mixed relationship between the two. Bangladesh, a country in the SAARC region has taken different financial reform policies in the same line with other developed and developing countries. The main purpose of this paper is to investigate the relationship between financial development and economic growth in Bangladesh. Annual time series data for the period 1976 to 2020 has been taken and the ARDL technique has been used for this purpose. The ARDL bound testing shows that there is a long-run relationship between financial development variables and economic growth. In the short run, all the proxies of financial development were found to have a significant relation to economic growth. The study has found two bidirectional causality and one unidirectional causality between the variables.

Keywords: Financial development, economic growth, ARDL, causality

1. INTRODUCTION

Bangladesh, one of the top 10 fastest-growing economies in the world, has seen its Gross Domestic Product (GDP) increase by more than triple over the past ten years.[1] According to the World Bank, since the nation's independence, its real GDP growth has accelerated, reaching an astounding 6.4% growth on average in the 2010s.[2] In addition, Bangladesh aims to achieve upper middle-income status by 2031 in line with its consistent growth in per capita income. Bangladesh is scheduled to leave its Least Developed Country (LDC) status in 2026.[3] The financial sector reforms that began in the middle of the 1980s and picked up speed in the 1990s resulted in a sharp increase in bank credit and the emergence of the capital market.

In this regard, it becomes quite natural to query whether the remarkable growth indicators and financial development indicators of Bangladesh are in any way connected to each other. If so, then which way? Is

[1] Gross Domestic Product (GDP) of Bangladesh, The World Bank
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=BD&start=2011

[2] Gross Domestic Product (GDP) growth of Bangladesh, The World Bank
https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=BD

[3] Bangladesh Country Overview, The World Bank
https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=BD

there any shot run or long run relation between these two indicators? Does there exist any causality between financial development and economic growth? If yes, then what is the direction of causality between them?

2. LITERATURE REVIEW

2.1. Theoretical literature

H. Patrick's (1966) work emphasized two approaches through which the interconnection between financial development and economic growth could manifest. He coined these as the "demand-following" and "supply-leading" modes. In the "demand-following" mode, there exists a scenario where finance adapts to the pace of economic growth. Here, the role of finance is characterized as being "essentially passive and permissive in the growth process" (Patrick 1966). The "supply-leading" strategy refers to an environment in which financial institutions collect savings and transform them into investments, a critical step in allowing the development of modern economic sectors. This, in our opinion, was the first attempt to address the question of causality in the literature on the connection between finance and economic growth. It is crucial to recognize that the two components of the finance-growth relationship are not distinct entities and instead interact in a way that typically corresponds to a stage of development.

Another fundamental research has been done by McKinnon (1973) and Shaw (1973) and their approach is popularly known as the McKinnon-Shaw hypothesis. In their research, they criticized the financial repression strategy widely practiced by many developing countries. This strategy suggests higher banking reserve rates, cross-border capital controls, and interest rate caps, to put it briefly. Consequently, it may be viewed as an implicit tax levied against financial institutions. Such a program is important in terms of the rising national debt and budget deficits. However, there is no question that financial repression hinders the growth of private financial institutions. McKinnon and Shaw strongly argued in favor of financial liberalization as a policy that would foster economic growth.

2.2. Empirical Literature

In a study by Jung (1986), data about the relationship between financial and actual progress was examined for a sample of 56 countries, 16 of which had developed economies. He employed the Granger test to determine the causality directions and used the M1/GDP and M2/GDP ratios as a proxy for financial development. His research showed that poor countries tended to follow a "supply-leading" pattern, whereas wealthy countries in Jung's sample tended to demonstrate a "demand-following" causation.

Similar causation studies were conducted by Darrat et al. (1989), although they concentrated on 4 nations that were "growth miracles". These nations were Hong Kong, Taiwan, Singapore, and South Korea. M2/GDP was used as the indicator of financial development throughout the research, which spanned the years from the late 1950s to the middle of the 1980s. In the instance of Hong Kong, the "supply-leading" tendency was clearly shown by the investigation. Taiwan and Singapore provided less support for the theory, however, South Korea indicated the "demand-following" relationship between financial and actual development.

Gupta (2011) was the first to apply the simultaneous equations approach (actually, VARs) in 1984 to analyze the relationship between financial development and economic growth in 14 emerging nations and once more discovered evidence in favor of the "supply-leading" trend. The author made every effort

to get around the shortage of data by relying his quantitative analysis on quarterly data for the years 1967 through 1977, which was a risky undertaking at the time.

De Gregorio and Guidotti (1992) for a sample of 98 nations between 1960 and 1985, utilizing bank lending to the private sector as a proxy for financial development tried to find out the relation between financial development and economic growth. For this huge sample, they discovered a strong positive impact of this financial development indicator on long-term growth. They then independently estimate the model for a sample of 12 nations in Latin America between 1950 and 1985 and find that the positive effect is not maintained, indicating to potential drawbacks of pooled assessment and the varied relationship between finance and growth across areas. Empirical data from Ghani (1992) shows a favorable correlation between a country's initial financial development and its subsequent GDP growth. 52 developing nations comprise his sample, spanning the years 1965 to 1989. Total financial institution assets as a percentage of GDP represent the first stage of financial growth, with years of education and investment rate serving as the two main determinants.

In a cross-country investigation, King and Lavine (1992) establish the relationship between financial structure and economic growth as well as the means by which financial indicators are connected to growth. Their research shows that there is a strong correlation between a number of financial indicators and economic development. The percentage of domestic credit given to banks and the percentage of credit allocated to private businesses was found to be marginally connected with growth among several financial indicators. Once more, cross-country regression shows that the relationship between financial indicators and growth is mediated by the proportion of national investment to GDP.

Through the use of panel data from five South Asian nations Financial development and economic growth were explored during the years 1974–2012 in the study "Financial Development and Economic Growth: Evidence from a Panel Study on South Asian Countries" by R. H. Rana and S. Barua (2015). They utilized the GDP growth rate as a stand-in for economic growth, and they used five key indicators to measure financial development: (i) domestic credit provided by the financial sector; (ii) total debt services; (iii) gross domestic savings; (iv) broad money; and (v) trade balance. The findings show that domestic savings and the rise of total debt service have a big influence on these nations' economic progress. Surprisingly, broad money, trade balance and domestic credit have no considerable influence on promoting economic growth which is generally unexpected.

According to Bhavish et al. (2018), who studied the BRICS countries, a country's financial structure is a major factor in determining its level of economic and financial growth. Their research led them to the conclusion that economies with market-based financial structures saw greater development in the short term but higher economic volatility in the long run. Therefore, financial growth will accelerate economic development more quickly with a better financial framework.

Using ARDL technique and the deposit liability ratio (DLR) and credit to private sector ratio (CPS) as proxies for financial development, Jalil and Ma (2008) seek to investigate the relationship between financial development and economic growth in China and Pakistan from 1960 to 2005. The study discovered that whereas both DLR and CPS significantly impacted growth in Pakistan, only DLR did so in China.

In their 2017 study, Puatwoe and Piabuo sought to determine how financial development affected economic expansion. They tested it using time series data from 1980 to 2014 from Cameroon. The study finds a short-run positive relationship between broad money, government spending, and economic growth as well as a short-run negative relationship between bank deposits, private investment, and

economic growth using the ARDL technique and three financial development indicators, including broad money, deposit/GDP, and domestic credit to the private sector. The bound test shows that financial indicators have a positive and significant influence on growth.

3. DATA AND METHODOLOGY

We employ some indicators that capture the financial development of Bangladesh. First, the most often used indicator of financial development is the ratio of broad money to GDP (M2/GDP) which reveals the extent of financial intermediation and the actual size of the nation's financial sector (King and Levine, 1993a and 1993b). A larger financial sector and greater financial intermediation are indicated by a higher M2 to GDP ratio. This ratio will continue to climb if the financial sector of the economy grows more quickly than the real sector. The second measure is the private sector credit-to-GDP ratio (DCY). This ratio is regarded as one of the most significant measures of the amount and scope of financial intermediation. This proxy provides insight into the lending-investment interplay. It is consistent with the McKinnon-Shaw inside money model, according to which financial intermediation determines the quality and quantity of capital accumulation, and thus economic growth (Demetriades and Hussein, 1996; Liang and Teng, 2006). Finally, this study uses GDP as a proxy variable of economic growth. It is critical to note that there are various disagreements on each of these proxies as indicators of financial progress (Wolde-Rufael 2009). As a result, there is no one aggregate measure that can capture the majority of features of financial development (Ang, 2008).

The time series data is yearly and spans the years 1976 to 2020. Our primary data source is the World Bank's World Development Indicators (WDI). All the variables are converted into log form to minimize heteroscedasticity by compressing the scale on which the variables are measured, resulting in a tenfold difference between the two values (Gujarati, 1995). Table-1 shows the descriptive statistics of the concerned variables.

Table-1: Descriptive Statistics for the variables

Variables	LNGDP	LN(M_2/GDP)	LNDCY
Mean	25.12042	3.441949	2.945794
Median	25.05046	3.361344	3.038876
Maximum	26.30961	4.166767	3.793396
Minimum	24.14735	2.435197	1.087014
Std. Dev.	0.642191	0.535482	0.711956
Skewness	0.266862	-0.191686	-0.779344
Kurtosis	1.883679	1.701552	2.799997
Jarque-Bera	2.870686	3.436765	4.630334
Probability	0.238034	0.179356	0.098750
Sum	1130.419	154.8877	132.5607
Sum Sq. Dev.	18.14600	12.61659	22.30278
Observations	45	45	45

3.1. Method of Analysis

The auto-regressive distributed lag (ARDL) approach established by Peseran and Peseran (1997) is used in this work to assess the relationship between the variables. This research employs the ARDL approach

over the cointegration technique established by Johansen and Juselius (1990) due to several desired features. They are as follows:

Firstly, for determining the long-run association between variables with a limited sample size, ARDL is a better approach (Ghatak and Siddiki, 2001).

Secondly, if the variables have a different order of integration, the ARDL approach can be utilized (Pesaran et al., 2001; Nkoro et al., 2016).

Thirdly, the ARDL approach uses a single reduced-form equation, whereas other cointegration techniques use a set of equations.

Fourthly, the ARDL approach requires fewer requirements than other standard techniques (Duasa, 2007).

Fifthly, endogeneity issues are eliminated in the ARDL approach by estimating short-run and long-run parameters simultaneously.

Sixthly, the ARDL approach enables us to generate an Error-Correction Form (ECM) that prevents the loss of long-run information (Shrestha, 2005).

3.2. Estimated Model

The generalized ARDL (p,q) model is specified as:

$$\Delta y_t = \phi_1 + \gamma_1 y_{t-1} + \gamma_2 x_{t-1} + \gamma_3 z_{t-1} + \theta_1 \sum_{i=1}^{n} \Delta y_{t-1} + \theta_2 \sum_{i=1}^{n} \Delta x_{t-1} + \theta_3 \sum_{i=1}^{n} \Delta z_{t-1} + \varepsilon_{1t}$$

Where $\gamma_1, \gamma_2, \gamma_3$ are long run coefficients and $\theta_1, \theta_2, \theta_3$ are short run coefficients. The specific ARDL models for evaluating the finance growth nexus of Bangladesh are as follows:

1. Model 1: Target variable is lnGDP

$$\Delta \mathbf{lnGDP_t} = a_{01} + \sum_{i=1}^{p} \mathbf{a_{1i}} \Delta \mathbf{lnGDP_{t-i}} + \sum_{i=0}^{q} a_{2i} \Delta \ln M2_{t-i} + \sum_{i=0}^{q} a_{3i} \Delta \ln DCY_{t-i} + \mathbf{b_{11}} \mathbf{lnGDP_{t-1}} + b_{21} \ln M2_{t-1} + b_{31} \ln DCY_{t-1} + \in_{1t}$$

2. Model 2: Target variable is lnM2/GDP

$$\Delta \mathbf{lnM2_t} = a_{02} + \sum_{i=1}^{p} \mathbf{a_{1i}} \Delta \mathbf{lnM2_{t-i}} + \sum_{i=0}^{q} a_{2i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q} a_{3i} \Delta \ln DCY_{t-i} + \mathbf{b_{11}} \mathbf{lnM2_{t-1}} + b_{21} \ln GDP_{t-1} + b_{31} \ln DCY_{t-1} + \in_{2t}$$

3. Model 3: Target variable is lnDCY Model

$$\Delta \mathbf{lnDCY_t} = a_{03} + \sum_{i=1}^{p} \mathbf{a_{1i}} \Delta \mathbf{lnDCY_{t-i}} + \sum_{i=0}^{q} a_{2i} \Delta \ln M2_{t-i} + \sum_{i=0}^{q} a_{3i} \Delta \ln GDP_{t-i} + \mathbf{b_{11}} \mathbf{lnDCY_{t-1}} + b_{21} \ln M2_{t-1} + b_{31} \ln GDP_{t-1} + \in_{3t}$$

4. Result and Discussion

4.1. Unit Root Test

A series with unit root have no tendency to return to long-run deterministic path and the variance of the

series is time dependent. A series with unit root suffers permanent effects from random shocks, thus, follow a random walk. That is, using (dependent and independent) time series that contain unit root in regression analysis, the classical results of the regression may be misleading. However, I(1) variables that exhibit a random walk without drift may have a mean that is constant over time, expected value of zero and, with trending variance; hence making the series with unit root to have the tendency to return to long-run path after removing deterministic trend. This reemphasized that; cointegration cannot be seen as a means to an end, but restricted. For stationarity of our data this paper runs both augmented Dickey-Fular test and Phillips-Paron test. Table-2 reflects the respective results. Both lngdp and ln(M2/GDP) are stationary at 1st difference and lnDCY is stationary at level. As the variables are in different order of integration, so we use ARDL model.

Table-2: Unit Root test: ADF test and Phillips-Perron test

	ADF test				PP test			
Variables	Level		1st difference		Level		1st difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
lnGDP	1.00	0.99	0.0001***	0.00***	1.00	0.99	0.00***	0.00***
Ln(M_2/GDP)	0.42	0.75	0.00***	0.00***	0.42	0.65	0.00***	0.00***
lnDCY	0.004***	0.09*	0.00***	0.00**	0.0005***	0.09*	0.00***	0.00***

(*),(**)&(***)significance at 10%, 5% & 1% respectively

4.2. Bound Cointegration Test

After validating the variables' stationarity, we examine whether there is any cointegration among the variables. The presence of cointegration indicates that all variables have a shared trend and are in long-run equilibrium. The bound F-test results are shown in Table-3. The H_0 of no cointegration is rejected if the estimated F-statistic is larger than the upper bound value. If the F-statistic is less than the lower bound value, the H_0 of no cointegration is accepted. Finally, the findings are inconclusive if the estimated F-statistic falls between the upper and lower limit values.

Table-3: Bound cointegration test result

Dependent variable	F-statistic	Decision
lnGDP	14.55***	Cointegration
ln(M_2/GDP)	5.90***	Cointegration
lnDCY	8.94***	Cointegration

The test equations include only constant term.***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

The bound test results indicate that in all the cases, where lnGDP, ln(M_2/GDP) and lnDCY are considered as dependent variable, show a high F-values compared to critical value at 1% level of significance given by Narayan (2004). Overall, the bound results imply that there is a conclusive evidence in favor of long-run relation among the variables. We can now move on to calculating the short-run and long-run regression coefficients.

4.3. Long-run estimates

The ARDL bound testing result also determines the long run coefficients. The three alternative models which we study in this paper and their long-run estimates are given in Table-4. When lnGDP considered as dependent variable one of the financial development proxy (M_2/GDP) has a positive coefficient and statistically significant, and the other proxy (DCY) found out to be negative and also statistically significant. It implies that in the long run, broad money (M_2/GDP) has a positive impact on economic

Table 4: Estimated long-run coefficiens

Variables	Model-1: lnGDP as dependent variable	Model-2: ln(M_2/GDP) as dependent variable	Model-3: lnDCY as dependent variable
lnGDP	----	2.7110 (5.430)***	-1.9312 (-13.688)***
Ln(M_2/GDP)	0.3159 (6.644)***	------	0.4730 (8.4684)***
lnDCY	-0.5615 (-12.988)***	1.7356 (8.7642)***	------

Values reported ( ) in brackets are the associated t-statistics
(***) significance at 1%
Values repprted here are the natural logs of the variables

growth in Bangladesh but domestic credit as percentage of GDP has shown a negative impact. It appeared from Table 4 that a 1% increase in broad money will cause economic growth to rise by 0.31%. On the contrary, a 1% increase in DCY will decrease economic growth by 0.56%.

In the second model where, broad money is taken as dependent variable the choice variables are found to be statistically significant. It is apparent (Table 4) that both economic growth and DCY have positive impact on broad money.

The third model with DCY as dependent variable shows negative and significant impact of economic growth and positive and significant impact of broad money.

4.4. Short-run estimates

The short-run estimates of the three ARDL models are given in Table-5. The first model with economic growth as dependent variable exhibits positive and significant (at 1% level) coefficient of broad money (ln(M_2/GDP)) which was expected, but the coefficient of lnDCY is came out to be negative but significant which was unexpected. The error correction term (ECT) represents the speed of adjustment of any model towards the long-run equilibrium. According to Pahlavani et al. (2005), the coefficient for the ECT and related t-statistic may be used to identify a stable model and long-run connection. According to them the ECT term should be negative (less than unity) and statistically significant. It is apparent that except Model-3 all the models satisfy the criteria. In Model-1and Model-2 the coefficients are -0.47 and -0.97 which implies that about 47% for Model-1 and 97% for Model-2 of the disequilibrium of thr previous year's shock can be adjusted in the current year.

It is evident from Table-5 that in the short-run when economic growth is dependent variable then broad money (M_2/GDP) shows a positive and significant impact whereas domestic credit as percentage of GDP shows significant negative impact. Again, when financial development indicator M_2/GDP is dependent variable then both economic growth and domestic credit shows positive and significant impact. Therefore, we have both way significant relation between economic growth and financial development in short-run.

Table 5: Short-run dynamics

	Model-1: lnGDP as dependent variable	Model-2: ln(M_2/GDP) as dependent variable	Model-3: lnDCY as dependent variable
ECT (-1)	-0.4728 (-9.27)***	-0.9773 (-5.90)	-1.7986 (-7.35)***
D(lnGDP)	--	3.5911 (4.02)***	-3.3593 (-6.17)***
D(ln M_2/GDP)	0.0747 (3.71)***	--	0.4953 (6.60)***
D(lnDCY)	-0.1377 (-6.75)***	1.060779 (7.79)***	--
R^2	0.90	0.81	0.940406
F stat	12.49	8.08	21.34975
D-W stat	1.94	2.01	21.34975

Values reported ( ) in brackets are the associated t-statistics
(***) significance at 1%
D denotes the first difference operator
Values repprted here are the natural logs of the variables

4.5. Causality analysis

The short-run causal effect can be seen through the t-statistic and F-statistics of the regressors of ARDL model. The result of the ARDL model taking all the variables one by one as dependent variable is shown in Table-6. The results indicate that when lnGDP is dependent variable the t-statistics of both the regressors of ln(M_2/GDP) and lnDCY are significant. The F-statistics from Wald tests also support the results. Thus, there exists short-run causal relation between the regressors and regressand. In the same way when ln(M_2/GDP) is dependent variable then t-statistics and F-statistics of both lnGDP and lnDCY shown significant result, thereby showing short-run causal relation. Lastly, when lnDCY is dependent variable only ln(M_2/GDP) has shown a significant causal relation.

Table 6: Causality test result

Dependent variable	t-statistic	Wald F-test
lnGDP	lnM_2/GDP: -3.80*** lnDCY: 2.13**	lnM_2/GDP: significant lnDCY: significant
ln M_2/GDP	lnGDP: 2.84*** lnDCY: 5.64***	lnGDP: significant lnDCY: significant
lnDCY	lnM_2/GDP: 4.76***	lnM_2/GDP: significant

(***)and (**) are significance at 1% and 5% respectively

Therefore, from Table-6 we can conclude that there exists a bidirectional causality between lnGDP and ln(M_2/GDP). Another bidirectional causality exists between lnDCY and ln(M_2/GDP). Lastly, we found a unidirectional causality runs from lnDCY to lnGDP.

4.6. Model diagnostics and stability

The econometric model by which we test our hypothesis should be robust. For the robustness of the model, we must check the coefficient diagnostic and stability diagnostic. For coefficient diagnostic we rely on Histogram-Normality test, Breusch-Godfrey serial correlation LM test and Breusch-Pagan-

Godfrey heteroscedasticity test. The test results are given in Table-7. The test results shows that all the models are free from serial correlation and heteroscedasticity, and the residuals are normally distributed. Further we go for estimating the stability of the models to ensure the acceptability of both short run and long coefficients. For stability test of our model, we rely on cumulative sum and cumulative sum squares which is proposed by Borensztein et al. (1998). Figure 1, 2 and 3 report CUSUM and CUSUMQ of all the three models of the study. The figures show that CUSUM test line falls within the 5% significant level critical boundary.

Table 7: Diagnostic test results

Diagnostic Test	Model-1: lnGDP as dependent variable	Model-2: ln(M_2/GDP) as dependent variable	Model-3: lnDCY as dependent variable
Normality test	0.67	0.39	0.70
Serial correlation	0.36	0.97	0.33
Heteroscedasticity	0.72	0.71	0.63

#All the values are probability values

Figure 1: Model 1(lnGDP as dependent variable)

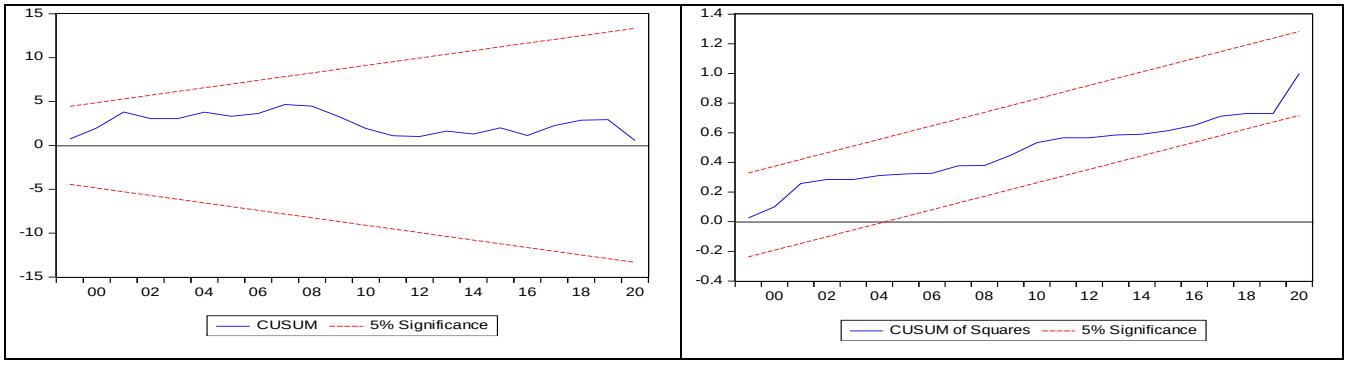


Figure 2: Model 2 (ln(M_2/GDP) as dependent variable)

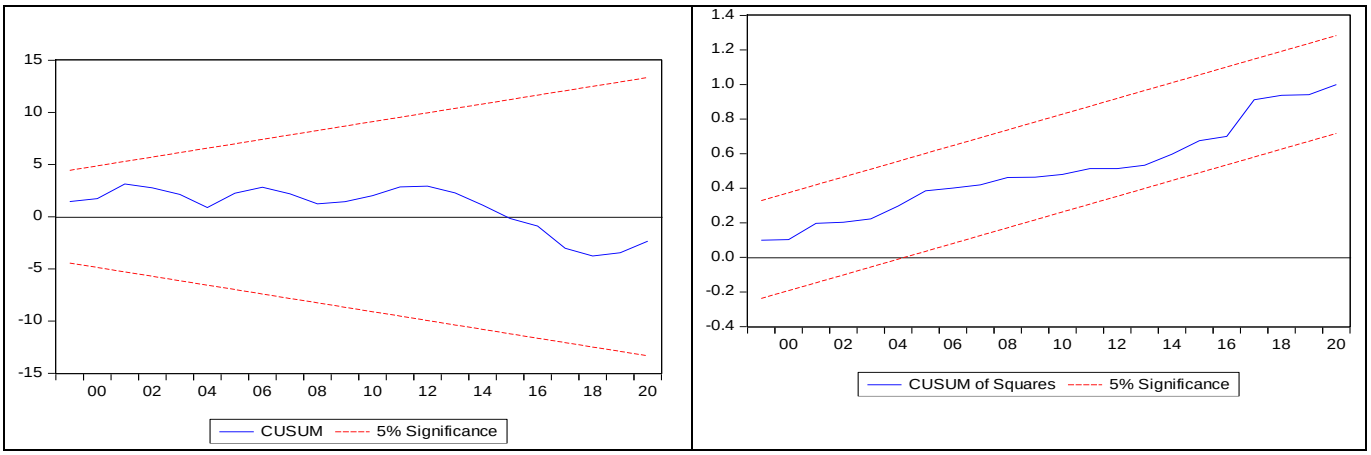
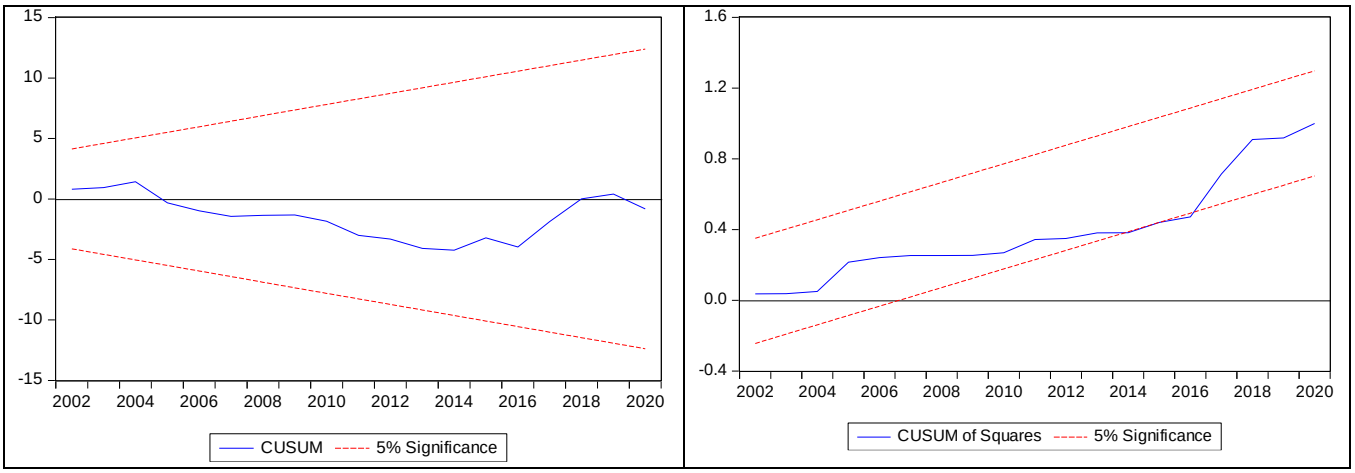


Figure 3: Model 3 (lnDCY as dependent variable)



5. Conclusion and recommendation

Using yearly time-series data from 1976 to 2020, this research paper explored experimentally the connection between financial development and economic growth in Bangladesh using ARDL bound technique. The test findings suggest that there is a long-run link between the macroeconomic variables examined, such as economic growth, broad money to GDP (M_2/GDP) and domestic credit to the private sector ad percentage of GDP (DCY). The long-run bound test result exhibit that M_2/GDP and DCY have significant long-run and short-run impact on economic growth. In the same way GDP and DCY have significant long-run and short-run impact on M_2/GDP. Again, GDP and M_2/GDP have significant long-run and short-run effect on DCY. We also run Wald test to examine the nature of causality between the variables. Our study revealed that there exists a bidirectional causality between lnGDP and ln(M_2/GDP). Another bidirectional causality exists between lnDCY and ln(M_2/GDP). Lastly, we found a unidirectional causality runs from lnDCY to lnGDP.

It is our recommendation that policymakers foster a favorable correlation between financial innovation and economic expansion. By integrating both formal and informal financial institutions into the financial system, the government should promote a competitive financial environment with more contacts. Again, for effective financial development, the right steps should be to accept new financial assets, services, and payment methods.

Authors' Biography

Arunava Kumar Choudhury is an assistant professor in Sripat Singh College, Jiaganj, Murshidabad, in India since 2016. He has been awarded M. Phil. in Economics in 2009 from University of Kalyani. Presently, he is pursuing his Ph.D. from Raiganj University, India. His areas of interest are agricultural economics and financial economics.

Subrata Saha was awarded with Ph.D. in Economics from the University of North Bengal. Dr. Saha specializes on issues of fiscal policies and effects of structural changes on fiscal relationships in Southeast Asian Countries and India. The areas of research interest are public finance and time series econometrics. He is a member of the editorial board of UGC CARE listed journal ENSEMBLE and a life member of the Indian Econometric Society and Indian Economic Association. Dr. Saha is presently working as a Professor of Economics at Raiganj University, West Bengal, India. He has supervised four M. Phil. and two Ph.D. scholars and presently supervising four Ph.D. scholars at Raiganj University. He

has contributed several research papers to national and international Journals and edited research volumes. Besides, he has authored two books to his credit. IRDP, India, has awarded him with prestigious Sarvepalli Radhakrishnan Lifetime Achievement National award in 2018 in recognition of his contribution to his activities toward promoting educational excellence. In 2023, Govt. of West Bengal has awarded him with "Shikkha Ratna" for his excellent contribution in the field of education.

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