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Revisiting the Nexus Between Financial Development, Foreign Direct Investment and Economic Growth of Bangladesh: Evidence from Symmetric and Asymmetric Investigation

Md. Qamruzzaman[1]*, Salma Karim[2] &Wei Jianguo[3]

[1]Assistant Professor, School of Business and Economics, United International University, Bangladesh
Postal Address: United City, Madani Avenue, Badda, Dhaka - 1212, Bangladesh

[2]Professor, School of Business and Economics, United International University, Bangladesh

[3]Professor, School of Economics, Wuhan University of Technology, China.

*Corresponding Author: zaman_wut16@yahoo.com

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Abstract

We revisit the nexus between foreign direct investment, financial development, and economic growth of Bangladesh over the 1975-2017 period. By apply Autoregressive distributed lagged (ARDL) advance by Pesaran et al. (2001a) and nonlinear Autoregressive Distributed Lagged (NARDL) initiated by Shin et al. (2014). We also investigate directional_causality by employing asymmetry casualty test proposed by Hatemi-j (2012). ARDL bound testing approach confirms the long-run association between economic growth and selected macroeconomic variables. We also observed the nonlinear effects, in the long run, running from financial development, FDI, trade openness, inflation to economic growth. Meanwhile, the results of asymmetry causality confirmed unidirectional causality between positive shocks in financial development and positive shock in economic growth, positive shocks in economic growth and positive shocks in FDI. Furthermore, symmetry causality test confirms bidirectional causality between financial development and economic growth and unidirectional causality running from FDI and inflation to economic growth.

Keywords: Financial development; FDI; Trade openness; economic growth, NARDL, Asymmetry Causality.

JEL: C32, F10, F43, O51

I. Introduction:

Economic stability, trade liberalization, and efficient financial system are the critical determinants of achieving sustainable economic development, especially in developing countries (Granger, 1986; Albu, 2013; Klasra, 2011; Jayachandran and Seilan, 2010). It is because economic development is the ability an economy to enhance the standard of living (Lewis, 2013), to increase the aggregated level of output (Solow, 1956), to economic expansion (Smyth, 1995) and more capable to the maximization of economic resources. As for the era of economic growth, the researchers present extensive literature in regards to identify and understand the key economic attributes, which are indispensable for viable economic growth. Over the past decades, a growing number of studies had been conducted and explored a number of key macroeconomic variables those are playing a critical role in achieving expected economic growth namely, effective and efficient financial sector, foreign capital inflows, trade openness, stable monetary policy, remittance, capital adequacy, and so on(). Therefore, academicians, policymakers, researchers, and corporate giants put their considerable effort of understating their behaviors and role in economic growth, particularly in developing countries.

The importance of the nexus between financial development and economic growth dully explained in mid of the 90s (Shaw, 1973; Gurley and Shaw, 1955). They acclaimed financial development is the engine of economic growth, it is because financial development not only enhances financial efficiency but also accelerates performance other segments of the economy such as augmentation of exports of the country(Akram et al., 2011). Furthermore, foreign trade and financial liberalization also accelerate economic growth through production process efficiency and capital adequacy in the economy (Turan Katircioglu et al., 2007; Bhattacharya and Sivasubramanian, 2003; Tadesse, 2002). In a study, Frankel and Romer (1999) argued trade openness support economy toward expansion of cross broader flows of goods and services through augmentation of export and import, such acceleration allows higher economic activities and eventually inject

energy to the development process. The growing role of foreign direct investment also appreciated in empirical studies as an alternative source of long-term capital, the medium of technological knowledge sharing, and technological advancement (Reza et al., 2018; Alvarado et al., 2017; Pandya and Sisombat, 2017). It is apparent that there are a vast number of empirical studies available in explaining the key macroeconomic variables role in economic growth.

However, in the connection of existing literature the contribution from this study, in particular, the novelty of the study relies on the following facts. First, even though we observed in empirical literature there are number researchers performed empirical studies based on Bangladesh economy of addressing macroeconomic variables effect on economic growth with conventional cointegration techniques. Meanwhile, in this study for exploring long term relationship between selected macroeconomic variables and economic growth we adopt the newly developed Autoregressive Distributed Lagged (ARD) bound testing approach introduced by Pesaran et al. (2001b). Second, in order to investigate the asymmetric relationship between selected financial development, FDI, Trade openness, inflation, and economic growth of Bangladesh, for the first time, we adopt non-linear Autoregressive Distributed Lagged proposed by Shin et al. (2014). Third, with this study, we also examined directional causality by applying asymmetry casualty test offered by Hatemi-j (2012).

To our best knowledge, this is the first ever-empirical study investigating the asymmetric relationship between financial development, trade openness, foreign direct investment and economic growth of Bangladesh. We observed, according to ARDL bound testing approach (Pesaran et al., 2001a), the long run association between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh. Meanwhile, ARDL under asymmetric assumption also established the existence of asymmetry relationship between explanatory variables and economic growth. In the connection of long-run asymmetry, study findings unveiled asymmetry

relationship between financial development, trade openness, foreign direct investment, trade openness and economic growth of Bangladesh. These findings suggesting that in the long run, the higher impact will observe in economic growth if any changes observed in explanatory variables of the study. Asymmetry causality test divulged unidirectional causality running from positive shock in financial development to positive shock in economic growth, positive shock in economic growth to positive shock in foreign direct investment

The remainder of this paper is organized as follows apart from section I: Section II deals with literature reviews pertinent to economic growth and key macroeconomic variables and includes a summary of empirical findings solely related to Bangladesh economy relevant to the current study. The detailed explanation about variable definition along with the econometrical methodologies, which will be used in the subsequent section for empirical investigation, explained in Section III. Section IV contains the empirical model estimation as well as model coefficient interpretation. Finally, Section V deals with the summary of study findings and policy recommendations for further development.

II. Review of Literature

Balance economic growth requires economic openness, capital adequacy, and stable economic policy to guide the economy in the expansion stage (Kormendi and Meguire, 1985). Modern dynamic economy performs with the interaction of both macro and microeconomic variables. Existing empirical studies persistently advocated macroeconomic variables including, financial development, export, imports, foreign direct investment, trade liberalization immensely influence on economic growth Barro, 1996; Helleiner, 1986.

The impact of financial development on economic growth is obvious in the empirical literature, a number of researchers including Gurley and Shaw (1955), Greenwood and Jovanovic (1990), Shaw (1973) acclaimed financial development are the engine of growth.

furthermore, The development of the financial sector, according to endogenous growth theory, channeling savings into productive investment and shaping economic growth process with aggregate efficiency (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993).

The efficient financial sector, according to Levine (1997), is critical to prospective economic growth in any economy. Since seminal work performed by Schumpeter (1911), the importance of well-established financial sector role in sustainable economic growth discussed in both theoretical and empirical investigation. A large number of researchers put their considerable effort of explaining the nexus between financial development and economic growth see (Asteriou and Spanos, 2019; Arora and Jalilian, 2018; Nyasha and Odhiambo, 2018; Madsen et al., 2018) by applying various econometrical techniques with panel data, cross-sectional data, firm-specific data.

By large, all the empirical studies explained there is a long-term cointegration between financial development and economic growth. In particular, they acclaimed that as long as financing sector shows positive improvement is causing economic growth that is financed nexus economic growth, implying more finance means more economic growth (Law and Singh, 2014). However, focusing on causal relations, empirical findings provide evidence supporting four types of hypothesis. First, the supply-leading hypothesis that is financial development promotes economic growth see (Sunde, 2017; Hassan et al., 2013; Omri et al., 2015), second, the demand-leading hypothesis that is economic growth demands financial efficiency with well-performed financial institutions. Third, feedback hypothesis, see, (Pradhan et al., 2016) and finally, neutral hypothesis referring no causality running between them see, (Habibullah and Eng, 2006). However, groups of researchers explore negative effects running from financial development to economic growth see for an instant (Samargandi et al., 2015; Duarte et al., 2017).

The role of FDI in the economy identified in empirical literature as a medium of technology transfer to economic growth augmentation (Borensztein et al., 1998). Technological diffusion, which can be observed the transformation of ideas and new technologies, play a critical role in economic growth. However, traditional solos growth framework assumes technological diffusion effects on economic growth is the same in all countries.

The proposition FDI-led economic growth confirmed by a number of empirical studies see, for an instant (Ali et al., 2018; Alvarado et al., 2017; Goh et al., 2017). Study findings unveiled evidence supporting *Supply-leading* unidirectional causality. This view refers to inflows of FDI in the economy increase economic activities with adequate long-term capital, investment opportunities optimization and technological advancement. It is also observed in the empirical literature that economic growth can also stimulate inflows of FDI which is *Demand-leading* unidirectional causality, referring economic growth entice foreign investors for channelizing their resources to those promising economy see, (Anwar and Nguyen, 2010).

With existing empirical studies focusing, the nexus between FDI and economic growth produced three types of causality. First, a group of researcher established the "*feedback hypothesis*" by confirming bidirectional causality running between FDI and economic growth sees (Tekin, 2012). Furthermore, No causality that is *neutral hypothesis* also established in empirical literature see, for example, Belloumi, 2014

The empirical literature suggests, trade openness-led economic growth through expansion of domestic trade, maximization of available economic resources along with promoting indoctrination in the economy (Shan and Sun, 1998; Caves, 1971). The nexus between trade openness and economic growth, in the earlier finance literature number of scholars including, Michaely (1977) & Andrei and Andrei (2015) found trade openness plays a beneficial role for sustainable economic growth. trade openness, according to Vohra (2001), accelerates economic growth with increasing utilization capacity, diffusion

of technology, and improve in specialization in the production proceed. On the other hands, Mah (2005) argued that liberalization of export positively influence industrialization, increase of capital goods import, and increase the scale of economics in the host country. While achieving the economy of the scale through the growth of exports, receiving this benefit over the period, a country must have to invest significant funds in research and development for serving the market with innovative products. Serving the market at an international level with the innovative products and services through the latest techniques of production processes, knowledge and skills is very much crucial.

Macroeconomic stability, having a lower level of inflation, can act as a catalyst towards improvement at the aggregated level output. Existing empirical studies did not produce a conclusive decision about the association between inflation and economic growth. A ground of studies stands economic growth negatively associated with inflation see, for an instant Mwakanemela and Kasidi, 2013). On the other hand, another group researches stand for a positive association with economic growth for an instant, Bhatia, 1960. In a study, Umaru and Zubairu (2012) argued that stable monetary policy ensures price stability in the economy, thus boost economic growth and support to increase the purchasing power of the population.

III. Methodology:

Data and variable definition

The study is based on annual time series data for the period 1974-2017. The dependent variable is economic growth, measured as a Growth rate of Gross Domestic Product per capita (Y). As far as, explanatory variables of the study, we consider four (04) macroeconomic variables. First, financial development (to capture the effect of financial growth), second, foreign direct investment(to capture the role of long term capital flows representing cross broader capital injection in the economy), third, Trade openness (to capture the importance of international factors in influencing economic activity), and fourth,

inflation (proxying for the stability of the macroeconomic and business environment). All the data collected from World Development Indicators published by World Bank (2017), World Economic Outlook (2017) published by IMF, Bangladesh Economic Review published by the Ministry of Finance (2018). Econometric analysis performs with EViews9.5 (2017).

The following generalized model can formulate by taking account of all research variables.

$$Y = \int FD, TO, FDI, INF \qquad (1)$$

To gauge long-run association and directional causality, the equation (1) can rewrite in the linear form as follows:

$$\ln(y_t) = \alpha_{0i} + \beta_1 \ln FD_t + \beta_2 \ln TO_t + \beta_3 \ln FDI_t + \beta_4 \ln INF_t + \varepsilon_t \qquad (2)$$

Where α for constant term, coefficients of β_1 *to* β_4 represents long-run elasticity in the equation, and ε_t denotes white noise.

The Autoregressive Distributed Lag (ARDL) Model

This study is using the ARDL model for the study due to the following benefits over other cointegration models. These are; First, the autoregressive distributed lag model is superior in consideration to regardless of sample size can either small or finite, consisting of 30 to 80 observations (Ghatak and Siddiki, 2001). Second, this approach is more suitable when variables are integrated in a different order like I (0) or/and I (1). Third, Modeling ARDL with the appropriate lags correct for both serial correlation and indigeneity problem (Pesaran et al., 2001a). Fourth, the ARDL model, simultaneously, can estimate long run and short run cointegration relations and provide unbiased estimation for the study (Pesaran et al., 2001a). The generalized ADRL model for assessing the long run association between financial development, Trade openness, foreign direct investment inflation and economic growth of Bangladesh is as follows:

$$\Delta ln(Y)_t = C_0 + \beta_1 \Delta ln(Y)_{t-1} + \beta_2 \Delta ln(FD)_{t-1} + \beta_3 \Delta ln(TO)_{t-1} + \beta_4 \Delta ln(FDI)_{t-1} + \beta_5 \Delta ln(INF)_{t-1} + \lambda_0 ln(Y)_{t-1} + \lambda_1 ln(FD)_t + \lambda_2 ln(FDI)_t + \lambda_3 ln(TO)_t + \lambda_4 log(INF)_t + \varepsilon_t \quad (3)$$

Where Δ indicates differencing of variables, while ε_t is the error term (white noise), and (t-1) is for the lagged period, λ_0 *to* λ_4 is long run coefficient. To capture the long run cointegration among variables, we formulate following ARLD models considering each variable as a dependent variable to estimate the best-fitted model for further analysis as shown in matrix form.

$$\begin{bmatrix} \Delta ln(Y)_t \\ \Delta ln(FD)_t \\ \Delta ln(TO)_t \\ \Delta ln(FDI)_t \\ \Delta\, ln(INF)_t \end{bmatrix} = \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \end{bmatrix} + \begin{bmatrix} ln(Y)_{t-1} \\ ln(FD)_{t-1} \\ ln(TO)_{t-1} \\ ln(FDI)_{t-1} \\ ln(INF)_{t-1} \end{bmatrix} \begin{bmatrix} \theta_{11}\ \theta_{12}\ \theta_{13}\theta_{14}\theta_{15} \\ \theta_{21}\ \theta_{22}\ \theta_{23}\theta_{24}\theta_{25} \\ \theta_{31}\ \theta_{32}\ \theta_{33}\theta_{34}\theta_{35} \\ \theta_{41}\ \theta_{42}\ \theta_{43}\theta_{44}\theta_{45} \\ \theta_{51}\ \theta_{52}\ \theta_{53}\theta_{54}\theta_{55} \end{bmatrix} +$$

$$\sum_{s=1}^{q} \begin{bmatrix} \mu_{11s}\ \mu_{12s}\ \mu_{13s}\mu_{14s}\mu_{15s} \\ \mu_{21s}\ \mu_{22s}\ \mu_{23s}\mu_{24s}\mu_{25s} \\ \mu_{31s}\ \mu_{32s}\ \mu_{33s}\mu_{34s}\mu_{35s} \\ \mu_{41s}\ \mu_{42s}\ \mu_{43s}\mu_{44s}\mu_{45s} \\ \mu_{51s}\ \mu_{52s}\ \mu_{53s}\mu_{54s}\mu_{55s} \end{bmatrix} \begin{bmatrix} \Delta ln(Y)_{t-s} \\ \Delta ln(FD)_{t-s} \\ \Delta ln(TO)_{t-s} \\ \Delta ln(FDI)_{t-s} \\ \Delta\, ln(INF)_{t-s} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \end{bmatrix} \quad (4)$$

The bound test for examining the long run association among variables can be conducted using F tests. The approximate Critical values for the F test can be obtained from (Pesaran et al., 2001b; Narayan, 2004). The null hypothesis of no cointegration among variables in equation (4) is $\theta_{11}, \ldots . \theta_{55} = 0$; and the alternative hypothesis is$\theta_{11}, \ldots . . \theta_{55} \neq 0$.

Due to following reasons, F-statistics has non-normal distributions (Narayan, 2004).

- ARDL model variables order of integration either me (0) or me (1).
- Number of regression used in the estimation
- Whether the ARDL model contains trend or/and intercept

The decision of cointegration existence is based on critical values and F-statistics. If F-statistics is greater than the critical value of upper bound I (1) then we can make conclusive inference about the existence of cointegration among the variables.
Once, the long run association established, the next two steps need to be executed to estimate long run and short run coefficients of the proposed ARDL models. The long-run ARDL (m, n, q, t, v, x, p) equilibrium model is as follows

$$lnY_t = \sigma_0 + \sum_{k=1}^{m} \beta_k ln(Y)_{t-k} + \sum_{k=0}^{n} \gamma_k ln(FD)_{t-k} + \sum_{k=0}^{q} \delta_k ln(TO)_{t-k} + \sum_{k=0}^{t} \mu_k ln(FDI)_{t-k} + \sum_{k=0}^{v} \pi_k ln(INF)_{t-k} + \varepsilon_t \quad (5)$$

The optimal lag length of ARDL model estimation determined by considering the Akaike Information Criterion (AIC).

Non-linear ARDL

Assessing relationship in empirical investigation, over the past few years the concept of nonlinearity between dependent and explanatory variables become one of the key aspects in explaining any nexus in empirical studies. In the line with non-linearity, Shin et al. (2014) introduce new non-linear cointegration equation by incorporating two sets of an additional variable in the equation namely, positive and negative shocks in an explanatory variable, which is widely known as Non-linear ARDL.

Since, a proposed new concept in estimating both long-run and short –run, a growing number of empirical studies extensively applying in their respective studies see, for example (Qamruzzaman and Jianguo, 2018a; Qamruzzaman and Jianguo, 2018c; Qamruzzaman and Jianguo, 2018b; Ali et al., 2018). In this study for capturing non-linearity between economic growth and macroeconomic variable, we transform equation (3) in non-linear form by replacing the entire explanatory variable by positive and negative shocks in the equation. The decomposition of positive and negative shocks of explanatory variables can be computed by using the following equations:

$$\begin{cases} POS(FD)_t = \sum_{k=1}^{t} lnFD_k^+ = \sum_{K=1}^{T} MAX(\Delta lnFD_k, 0) \\ NEG(FD)_t = \sum_{k=1}^{t} lnFD_k^- = \sum_{K=1}^{T} MIN(\Delta lnFD_k, 0) \end{cases} \quad (6a)$$

$$\begin{cases} POS(TO)_t = \sum_{k=1}^{t} lnTO_k^+ = \sum_{K=1}^{T} MAX(\Delta lnTO_k, 0) \\ NEG(TO)_t = \sum_{k=1}^{t} lnTO_k^- = \sum_{K=1}^{T} MIN(\Delta lnTO_k, 0) \end{cases} \quad (6b)$$

$$\begin{cases} POS(FDI)_t = \sum_{k=1}^{t} lnFDI_k^+ = \sum_{K=1}^{T} MAX(\Delta lnFDI_k, 0) \\ NEG(FDI)_t = \sum_{k=1}^{t} lnFDI_k^- = \sum_{K=1}^{T} MIN(\Delta lnFDI_k, 0) \end{cases} \quad (6c)$$

$$\begin{cases} POS(INF)_t = \sum_{k=1}^{t} lnFDI_k^+ = \sum_{K=1}^{T} MAX(\Delta lnINF_k, 0) \\ NEG(INF)_t = \sum_{k=1}^{t} lnINF_k^- = \sum_{K=1}^{T} MIN(\Delta lnINF_k, 0) \end{cases} \quad (6d)$$

Following Shin et al. (2014), the partial sum asymmetry cointegration equation now can be obtained by inserting positive and negative shocks of the explanatory variable in standard symmetric equation (3) and the new non-linear ARDL as follows:

$$\begin{aligned} \Delta lnY_t = {} & \alpha_0 + \sum_{i=1}^{n} \mu_1 \Delta lnY_{t-i} + \sum_{i=0}^{m} \mu_2^+ \Delta lnPOS(FD)_{t-i} + \sum_{i=0}^{k} \mu_2^- \Delta lnNEG(FD)_{t-i} \\ & + \sum_{i=0}^{r} \mu_3^+ \Delta lnPOS(TO)_{t-i} + \sum_{i=0}^{r} \mu_3^- \Delta lnNEG(TO)_{t-i} + \sum_{i=0}^{P} \mu_4^+ \Delta lnPOS(FDI)_{t-i} \\ & + \sum_{i=0}^{P} \mu_4^- \Delta lnNEG(FDI)_{t-i} + \sum_{i=0}^{q} \mu_5^+ \Delta lnPOS(INF)_{t-i} \\ & + \sum_{i=0}^{q} \mu_5^- \Delta lnNEG(INF)_{t-i} + \gamma_0 lnFDI_{t-1} + \gamma_1^+ lnPOS(FD)_{t-1} \\ & + \gamma_1^- lnNEG(FD)_{t-1} + \gamma_2^+ lnPOS(TO)_{t-1} + \gamma_2^- lnNEG(TO)_{t-1} \\ & + \gamma_3^+ lnPOS(FDI)_{t-1} + \gamma_3^- lnNEG(FDI)_{t-1} + \gamma_4^+ lnPOS(INF)_{t-1} \\ & + \gamma_4^- lnNEG(INF)_{t-1} + \omega_t \end{aligned} \quad (7)$$

In equation (7), m. n. r, p, and q denote the optimal lag length for model estimation. A standard Wald test to be performed for ascertaining the long-run asymmetric effect from financial development, trade openness, foreign direct investment and inflation to economic growth with the null hypothesis of symmetry:

$$H_0 = (\gamma_1^+ = \gamma_1^-);\ (\gamma_2^+ = \gamma_2^-);\ (\gamma_3^+ = \gamma_3^-);\ (\gamma_4^+ = \gamma_4^-)$$

Against, the alternative hypothesis of asymmetry:

$$H_1 = (\gamma_1^+ \neq \gamma_1^-);\ (\gamma_2^+ \neq \gamma_2^-);\ (\gamma_3^+ \neq \gamma_3^-);\ (\gamma_4^+ \neq \gamma_4^-)$$

Rejection of the null hypothesis confirms the existence of asymmetrical effects from financial development, trade openness, foreign direct investment, and inflation to the economic growth of Bangladesh in the long run. The long-run elasticity can be computed through, for$FD^+ = \frac{-\gamma_1^+}{\gamma_0}$; $FD^- = \frac{-\gamma_1^-}{\gamma_0}$; $TO^+ = \frac{-\gamma_2^+}{\gamma_0}$; $TO^- = \frac{-\gamma_2^-}{\gamma_0}$;$FDI^+ = \frac{-\gamma_3^+}{\gamma_0}$; $FDI^- = \frac{-\gamma_3^-}{\gamma_0}$; $INF^+ = \frac{-\gamma_4^+}{\gamma_0}$; and $INF^- = \frac{-\gamma_4^-}{\gamma_0}$;

To investigate the existence of the long run asymmetric relationship, shin proposed a bound test, which is a joint test of all lagged levels of regressors. Wald F-test is utilized to test the null hypothesis that is no asymmetric relationship $H_0: \gamma_0 = \gamma_1^+ = \gamma_1^- = \gamma_2^+ = \gamma_2^- = \gamma_3^+ = \gamma_3^- = \gamma_4^+ = \gamma_4^- = 0$

Against, the alternative hypothesis $H_1: \gamma_0 \neq \gamma_1^+ \neq \gamma_1^- \neq \gamma_2^+ \neq \gamma_2^- \neq \gamma_3^+ \neq \gamma_3^- \neq \gamma_4^+ \neq \gamma_4^- \neq 0$

The rejection of null hypothesis ascertains the long-run and short-run asymmetric relationship between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh.

Asymmetry causality following Hatemi-j (2012)

Investigation of asymmetry relationship between variables in the empirical test requires two additional sets of data representing the decomposition of a variable into cumulative positive and negative changes. The initial idea of variable decomposition into positive and negative changes initiated by Granger and Yoon (2002) in their study of exploring hidden cointegration test. Hatemi-j (2012) extends their work to casualty analysis and inferring it as asymmetry causality test. It is asymmetry, according to Hatemi-j (2012), in a sense that positive and negative changes may not produce similar effects on the dependent variable. Furthermore, Hatemi-j (2012)initiated the causal investigation between two variables namely y_{1t} and y_{2t} with random walk proposition and define their relation in the following ways:

$$y_{1t} = y_{1\,t-1} + \varepsilon_{1\,t} = y_{10} + \sum_{i=1}^{t} \varepsilon_{1t} \qquad (8)$$

And,

$$y_{2t} = y_{2\,t-1} + \varepsilon_{2\,t} = y_{20} + \sum_{i=1}^{t} \varepsilon_{2t} \qquad (9)$$

Where *t=1, 2……T,* the constant $y_{1,0}$ and $y_{2,0}$ are the initial value and the value $\varepsilon_{1t}$and ε_{2t} explain the white noise disturbance term. The positive and negative shock can be computed $\varepsilon_{1t}^{+} = MAX(\varepsilon_{1t}, 0)$, $\varepsilon_{2t}^{+} = MAX(\varepsilon_{2t}, 0)$, $\varepsilon_{1t}^{+} = MIN(\varepsilon_{1t}, 0)$, and $\varepsilon_{2t}^{+} = MIN(\varepsilon_{2t}, 0)$, respectively.. Therefore, we can represents $\varepsilon_{1t} = \varepsilon_{1t}^{+} + \varepsilon_{1t}^{-}$, and $\varepsilon_{2t} = \varepsilon_{2t}^{+} + \varepsilon_{2t}^{-}$. So, the equation () and () can reproduce in the following ways by in integrating variable decomposition.

$$y_{1t} = y_{1\,t-1} + \varepsilon_{1\,t} = y_{10} + \sum_{i=1}^{t} \varepsilon_{1t}^{+} + \sum_{i=1}^{t} \varepsilon_{1t}^{-} \qquad (10)$$

And,

$$y_{2t} = y_{2\,t-1} + \varepsilon_{2\,t} = y_{20} + \sum_{i=1}^{t} \varepsilon_{2t}^{+} + \sum_{i=1}^{t} \varepsilon_{2t}^{-} \qquad (11)$$

In our study, in order to capture the asymmetric effects of all the variables positive and negative shocks of all variables can be computed in the following ways:

$$Y_t^+ = \sum_{i=1}^{t} \varepsilon_{1t}^+, Y_t^- = \sum_{i=1}^{t} \varepsilon_{1t}^-, FD_t^+ = \sum_{i=1}^{t} \varepsilon_{2t}^+, FD_t^- = \sum_{i=1}^{t} \varepsilon_{2t}^-, TO_t^+ = \sum_{i=1}^{t} \varepsilon_{3t}^+, TO_t^- = \sum_{i=1}^{t} \varepsilon_{3t}^-, FDI_t^+ = \sum_{i=1}^{t} \varepsilon_{4t}^+, FDI_t^- = \sum_{i=1}^{t} \varepsilon_{4t}^-, INF_t^+ = \sum_{i=1}^{t} \varepsilon_{5t}^+, INF_t^- = \sum_{i=1}^{t} \varepsilon_{5t}^- \quad (12)$$

The next step is to investigate the causal relationship by applying vector autoregressive (VAR) model with an order of *p.* the innovative lagged can be determined by following Hatemi-j (2003); Hatemi-J (2008) with given following process for selecting optimal lag length in VAR situation:

$$HJC = ln\left(\left|\bar{A}_j\right|\right) + q\left(\frac{n^2 lnT + 2n^2 \ln(lnT)}{2T}\right), q = 0, \ldots \ldots p \quad (13)$$

Where $\bar{A}_j$ stands for determinants of VAR covariance – matrix of the error correction term in the VAR model using the lag order q. n specifies the number of the equation in the equations and T denotes for a number of observations.

IV. Data analysis and discussion

Unit root test:

Empirical investigation with time series data subject to investigation of their level of integration, it is because econometric model selections rely on that. In particular, variable at I (2), implying stationary after 2nd difference will not be considered from investigation otherwise superior findings will arrive. Testing the variable order of integration, we performed the Augmented Dickey-Fuller test proposed by Dickey and Fuller (1979) and Phillip-Perron test proposed by Phillips and Perron (1988). Stationary test results exhibited in

Table 1. Study findings unveiled a mixed order of integration that is either at the level I (1) or and after first difference 1(2). Most importantly, there is no 2nd order variable in the equation, which is desirable to run cointegration to for investigating the long-run association among model variables with ARDL bound testing approach offered by Pesaran et al. (2001b).

Table 1 **Stationarity test results**

	ADF			PP		
	At level	1st difference	Order of Integration (1)	At level	1st difference	Order of integration (1)
lnY	-1.43	-6.19***	I(1)	-1.43	-4.48***	I(1)
lnFD	-2.14	-3.19**	I(1)	-5.45***		I(0)
lnTO	-1.57	-6.38***	I(0)	-0.75	-6.55**	I(1)
lnFDI	-2.52	-6.8***	I(1)	-0.52	-6.57***	I(1)
lnINF	5.26***		I(0)	5.16***		I(0)

Note 1: ADF for Augmented Dicky-Fuller Test and P-P for Philips and Perron test

Note 2. ***/**, indicates level of significance at 1% and 5%, respectively.

ARDL bound testing

We observed in unit root estimation that variable is integrated in mixed order such either at the level I(0) or/and after first difference I (1). Such a mixed order of integration allows applying newly developed cointegration test approached proposed by Pesaran, Shin, and Smith (see, (Pesaran et al., 2001a).ARDL bound testing approach investigates cointegration by comparing F-statistics with the critical value which is extracted from Pesaran et al. (2001a) and Using equation 10, where each variable treated as a dependent variable for calculation of F-statistics. The calculated F-statistics are reported in Table 2.

We observed that the calculated F-statistics $F_Y = Y|FD, TO, FDI, INF = 10.855$, when economic growth considered as the dependent **variable**, is higher than the critical value which are extracted from Pesaran et al. (2001b) at a 1% level of significance. This

suggests that the null hypothesis "no-cointegration" can rejected, alternatively, the existence of cointegration confirmed. However, when the rest of the variable treated as a dependent variable, the F-statistics $F_{FD} = FD|Y, TO, FDI, INF = 15.905$, $F_{TO} = TO|Y, FD, FDI, INF = 14.701$, $F_{FDI} = FDI|Y, FD, TO, INF = 2.49$, and $F_{INF} = INF|Y, EX, IMP, GCF = 2.53$, respectively. This is suggesting no cointegration available in other models, since the F-statistics except Export model are lower than the critical value at a 1% level of significant. Therefore, we can assumed that there is a long-run relationship between economic growth, Import, Exports, Gross capital formation and Inflation in Bangladesh.

Table 2 ARDL-Bound testing results

		F-statistics		Remarks	
$\Delta lnY_t = \left[F_{lnY_t}\left((lnY_t)\middle\vert lnTO_t, lnFD_t, lnINF_t, lnFDI_t\right)\right]$		10.855***		Present	
$\Delta lnFD_t = \left[F_{\ln FD_t}\left((\ln(FD_t)\middle\vert lnY, \ln TO_t, \ln INF_t, \ln FDI_t\right)\right]$		15.905***		Present	
$\Delta lnTO_t = \left[F_{lnTO_t}\left((lnTO_t)\middle\vert lnY_t, lnFD_t, ln\mathrm{FDI}_t, \ln INF_t\right)\right]$		14.701**		Present	
$\Delta lnFDI_t = \left[F_{lnFDI_t}\left((lnFDI_t)\middle\vert lnY_t, In\mathrm{FD}, lnTO_t, lnINF_t\right)\right]$		2.53		Absent	
$\Delta lnINF_t = \left[F_{lnINF_t}\left((lnINF_t)\middle\vert lnY_t, lnFD_t, lnTO_t, ln\mathrm{FDI}_t\right)\right]$		2.49		Absent	
Critical Value		5%		1%	
Pesaran et al. (2001a)	K	I(0)	I(0)	I(0)	I(0)
	4	2.86	4.01	3.74	5.06

Long run and short run elasticities

It is observed from the bound testing approach that long-run cointegration prevails between economic growth and its determents particularly when economic growth treated as the dependent variable in the equation. We now move to perform the next two steps in determining the long run and short-run elasticities.

Table *3* exhibits long-run model coefficients. We observed that in the long run trade openness, financial development and foreign direct investment positively cause

economic growth and the effect of inflation negatively associated with economic growth of Bangladesh. The model coefficients sign provide further evidence, which is conjecture with an existing theoretical explanation.

Table 3 Long-run results for the period, 1975 - 2017

Dependent variable: Economic growth (Y) Regressors:	Coefficients	Std. Error	Probability
Financial development	0.499	0.499	0.032
Trade openness	0.358	0.332	0.000
Foreign direct investment	0.238	0.408	0.056
inflation	-0.087	0.094	0.027
Constant	-3.994	1.133	0.000

Short-run dynamics model estimation and the results reported in *Table 4*. The coefficient of the lagged error correction term (ECT_{t-1}) is negative and statistically significant at a 1% level of significance. Finding ascertains that the series is non-explosive that is long-run equilibrium attainable from any prior year shocks in the explanatory variables. The coefficient 64.9% explains high speed to reach its long run equilibrium having prior year shock in an explanatory variable to economic growth.

Similar to the long run, in the short run study findings unveiled positive effects from financial development and foreign direct investment to economic growth. Meanwhile, the effects from trade openness appear negative to economic growth, the possible inference can be done such as in the short run trade openness might concentrate on acquiring consumer goods and service rather heavy equipment and machinery.

Our short rum model estimation also passes through several diagnostic tests namely, a test of autocorrelation, normality, and heteroscedasticity in the error term stability and stability test (see, Table 4). We observed that the model is free from autocorrelation disturbance in error correction. The normality test statistics confirm the

error term is normally distributed, and finally, the RESET test assures the model is well specified.

Table 4 Error-correction representation of selected ARDL model

Dependent variable $\Delta \ln Y_t$	Coefficients	Std. Error	Probability
Regressors			
ECT_{t-1}	-0.649	0.332	0.000
Constant	-0.930	0.117	0.000
ΔlnFD	0.464	0.453	0.311
Δln TO	-0.263	0.338	0.000
ΔlnFDI	0.222	0.387	0.569
ΔlnINF	-0.008	0.087	0.927
Diagnostic Test			
R^2		0.71	
$F^2_{statistics}$		1.51 (0.023)	
$x^2_{Autocorrelation}$		0.47 (0.49)	
$x^2_{Normality}$		1.61 (0.44)	
$x^2_{Heteroskedasticity}$		6.78 (0.47)	
x^2_{RESET}		3.65 (0.24)	
CUSUM		Stable	
CUSUMS		Stable	

Non-linear ARDL model Estimation

We found that the overall predictive power of the empirical model for investigating the asymmetric relationship between financial development, trade openness, foreign direct investment, inflation, and economic growth is higher. It is because all residual diagnostic namely, a test of autocorrelation, a test of normality, Heteroskedasticity and RESET associated with nonlinear ARDL confirmed model well specification. Furthermore, by following Pesaran et al. (2001a), Bahmani-Oskooee and Mohammadian (2016), we also perform model stability test with CUSUM and CUSU of squares of recursive residuals tests, suggesting that the estimated parameters as stable since the values fall within the critical level at a 5% level of significance (see, figure 1, 2)

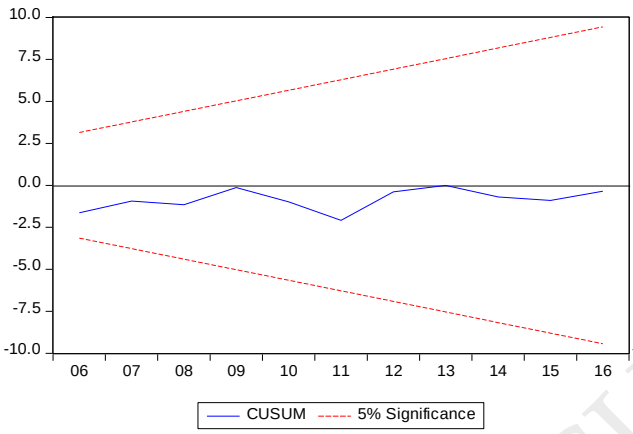

Figure 1. Plot of CUSUM of recursive residuals (Asymmetric ARDL)

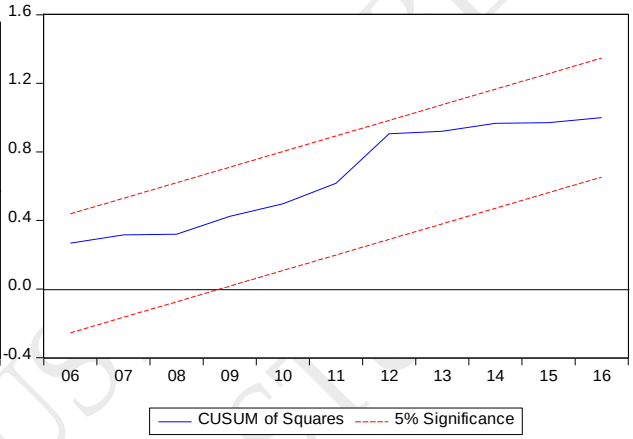

Figure 2. Plot of CUSUM of squares of recursive residuals (Asymmetric ARDL)

Next, we move to investigate the existence of asymmetric association by applying a standard Wald test with the null hypothesis of symmetric that isH_0: $\gamma_0 = \gamma_1^+ = \gamma_1^- = \gamma_2^+ = \gamma_2^- = \gamma_3^+ = \gamma_3^- = \gamma_4^+ = \gamma_4^- = 0$. It is observable from F-statistics that the assumption of asymmetric cointegration among variables is apparent, since F_{pass} coefficient is higher than the critical value at a 1% level of significant. This finding suggests a long run asymmetric relationship between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh. Therefore, the application of

nonlinear ARDL in examining nexus is important to explore new insights. The details model estimation explained below.

Table 5 the dynamic Long-run and Short-run model estimation

	Coefficients	Standard error	Probability
Constant	-5.249	0.730	0.000
lnY_{t-1}	-0.615	0.336	0.000
$lnFD^{+}_{t-1}$	0.274	2.847	0.000
$lnFD^{-}_{t-1}$	0.357	5.848	0.000
$lnTO^{+}_{t-1}$	-0.528	4.658	0.000
$lnTO^{-}_{t-1}$	0.726	13.47	0.000
$lnFDI^{+}_{t-1}$	0.248	1.723	0.008
$lnFDI^{-}_{t-1}$	-0.010	1.186	0.000
$lnINF^{+}_{t-1}$	-0.268	0.186	0.000
$lnINF^{-}_{t-1}$	0.378	0.267	0.000
ΔY(-3)	0.090	0.157	0.007
ΔY(-1)	0.366	0.254	0.007
ΔFD_P(-1)	-9.267	2.947	0.009
ΔFD_P(-3)	-10.932	2.743	0.002
ΔFD_P(-4)	-4.565	0.980	0.000
ΔFD_N(-1)	-0.396	5.254	0.000
ΔFD_N(-2)	-22.698	4.692	0.000
ΔFD_N(-3)	-0.481	2.414	0.021
ΔFD_N(-4)	-8.016	2.997	0.021
ΔTO_P(-1)	1.835	5.104	0.005
ΔTO_P(-2)	4.148	2.879	0.177
ΔTO_P(-3)	0.291	3.875	0.022
ΔTO_N(-1)	3.188	12.03	0.000
ΔTO_N(-2)	1.298	9.744	0.001
ΔTO_N(-3)	1.678	8.028	0.002
ΔTO_N(-4)	0.265	8.102	0.455
ΔFDI_P(-1)	-0.934	1.854	0.0001
ΔFDI_P(-2)	-1.085	1.757	0.000
ΔFDI_P(-3)	-7.596	1.822	0.001
ΔFDI_P(-4)	-2.290	0.973	0.038
ΔFDI_N(-1)	1.111	2.291	0.000
ΔFDI_N(-2)	7.111	1.553	0.000
ΔFDI_N(-4)	-4.047	1.992	0.067
ΔINF_P(-1)	-0.835	0.175	0.000
DINF_P(-3)	-0.227	0.136	0.123
ΔINF_N(-1)	-1.441	0.212	0.000
ΔINF_N(-4)	-0.432	0.159	0.020
ECT(t-1)	-0.563***	0.242	
Fpass	13.306***		
Residual Diagnostic test			
R^2	0.7543		
$F^2_{statistics}$	7.04***		
$x^2_{Autocorrelation}$	1.52(0.21)		
$x^2_{Heteroskedasticity}$	1.12(0.26)		
$x^2_{Normality}$	21.64(0.29)		

Furthermore, we move to ascertain asymmetric relationship in the long term and short run time horizon. A standard Wald test executed in this regard with the null hypothesis of symmetry, against the alternative hypothesis asymmetry. The test statistics of explanatory variables in the long term and short-run reported in Table 6. We observed for the long run Wald test coefficients of Financial development, trade openness, foreign direct investment, and inflation ($W_{FD} = 14.965$, $W_{TO} = 17.542$, $W_{FDI} = 12.223$, and $W_{INF} = 13.796$) are statistically significant at a 1% level of significance. This is implying that in the long run there is asymmetric relationship exist between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh. For the short run, the null hypothesis additive symmetry rejected since the values of the Wald test are statistically significant at a 1% level of significance. This conclusion is applicable for all four explanatory variables. Based on Wald test findings, we can conclude asymmetric effecting running from financial development, trade openness, foreign direct investment and inflation to the economic growth of Bangladesh both in the long term and in short t run. This suggesting that any changes in explanatory variables the higher effect could observed in economic growth.

Table 6 Testing of the long run and short run asymmetric relationship

Variable	Long run		Shor-run	
	F-statistics	Asymmetry	F-statistics	Asymmetry
Financial development	14.965***	√	22.553***	√
Trade Openness	17.542***	√	17.637***	√
Foreign Direct investment	12.223***	√	17.828***	√
Inflation	13.796***	√	12.369***	√

Long run asymmetric effects from financial development, trade openness, foreign direct investment and inflation to the economic growth of Bangladesh represented in Table *7*.

In the long term, we observed that the positive shock in financial development positively linked with economic growth of Bangladesh (a coefficient of 0.446), which is implying that any further improvement in the financial sector will be worked as a stimulus for accelerating economic growth. In particular, a 10% increase in financial development will bring 4.46% of economic growth. By contrast, negative shock in financial development is also positively associated with economic growth (a coefficient of 0.580). This finding suggesting that any negative shock on the financial sector will cause negatively on economic growth. The magnitude from financial development shock to economic growth both are positively linked, however, negative shock shows greater intense than positive shocks. Therefore, considering financial development policy it is important to expand financial sectors activities such as allows financial institutions for credit expansion, easy access to credit by entrepreneur, and efficient channelizing of economic resources. More particular, expansionary financial policies needed to be implemented through balancing financial development with other financial aspects.

In the long-term, trade openness positive shocks negatively induce economic growth of Bangladesh (a coefficient of -0.858), which is indicating that the potential expansion of domestic trade through internationalization implying expansion through exports and imports will hamper economic growth. In particular, a 10% increase in trade openness resulting in 8.58% decrease in economic growth in Bangladesh. The possible explanation could be a heavy reliance on import items with consumer goods rather machinery and equipment of prospective industrialization. Such reliance on import on consumer goods negatively cause industrialization and reduce aggregated production in the economy, nonetheless. By contrast, we observed that negative shock in trade openness negatively linked with economic growth (a coefficient of -1.179), implying that constriction policy in regards to trade internationalization will assist in increasing aggregated output eventually boost economic growth. The imposition of any trade restriction will positively entice economic growth by allowing expansion of domestic

production, it is because currently Bangladesh heavily reliance on imported goods rather own production. This is why; reduction of imports especially consumer goods would emerge as a new avenue for industrialization and optimization of economic resources in the economy.

FID-led growth in the long term, we observed that positive variation in FDI positively associated with economic growth of Bangladesh (a coefficient of 0.402). In particular, a 10% increase in FDI inflows in Bangladesh economy will generate additional 4.02% of economic growth by expanding economic activates. The prospective FDI-led growth hypothesis prevails, this finding suggests that investment from foreign investors will assists in expanding economic activities since, foreign direct investment bring technological changes, transfer managerial know-how, access to scare raw materials, and production efficiency in the economy, therefore, economic expansion is inhabitable. We also observed that the negative shock of foreign direct investment negatively influence on economic growth (a coefficient -0.017), unveiling a reduction of FDI will also cause economic growth positively. The possible reason could be with foreign investment contraction allows domestic investors to grab the opportunities available in the economy and contribute to economic growth.

Finally, inflation-growth nexus, we observed positive shock in inflation positively linkage with economic growth (a coefficient of 0.436), on the other hand, the negative shock in inflation also results in positive effects on economic growth (a coefficient of 0.940). In particular, a 10% increase and decrease of inflation will cause a 4.36% increase in economic growth due to positive shock and a 9.4% decrease in economic growth resulting from negative shock in inflation. It is apparent that the negative shock of inflation magnitude is significant that positive shock. Therefore, Bangladesh economy should follow controlled inflation policy because the stagnant economy does not wealth enough for economic expansion, especially in the long term.

Table 7 Long-run asymmetric effects

	Coefficients	Standard error	P-value
L_{FD}^{+}	0.446	2.847	0.000
L_{FD}^{-}	0.580	5.848	0.000
L_{TO}^{+}	-0.858	4.658	0.000
L_{TO}^{-}	-1.179	13.476	0.000
L_{FDI}^{+}	0.402	1.723	0.008
L_{FDI}^{-}	-0.017	1.186	0.000
L_{INF}^{+}	0.436	0.186	0.000
L_{INF}^{-}	0.940	0.267	0.000

Asymmetric causality between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh

The results of asymmetry and non-asymmetry causality test exhibit in Table 8. Causality reports in a row from (1) to (6) dealing with financial development and economic growth. We observed bidirectional symmetric causality between financial development and economic growth (line 1, and line 4) and unidirectional asymmetric causality running from positive shock in financial development to positive economic growth (line 5). Study findings suggesting that future financial expansion in Bangladesh will augment economic growth. It is because financial development intensifies economic activities through encouraging productive investment with capital adequacy. On the other hand, study findings unveiled neutral causality between a positive shock in economic growth and positive shock in financial development (line 2), negative shock in economic growth and negative shock in financial development (line3) and negative shock in financial development and negative shock in economic growth (line 6).

From line (7) to line (12) explain causality between trade openness and economic growth under both symmetry and asymmetry assumption. Study findings disclosed unidirectional symmetry causality running from trade openness to economic growth

(line 10). We also noticed asymmetry unidirectional causality running from positive shock in trade openness and positive shock in economic growth (line 11). Study findings postulated that further improvement in trade openness results in a higher pace in economic growth. The possible explanation could be inferred that is domestic market expansion could ensure resources optimization and greater production possibilities.

In regards to causality between foreign direct investment and economic growth of Bangladesh reported in line 13 to line 18. We observed symmetry unidirectional causality running from foreign direct investment to economic growth (line 16). Similarly, in the connection of asymmetric casualty, a study unveiled unidirectional causality running from positive shock in economic growth to positive shock in foreign direct investment (line 14). However, study findings unable to bring any further evidence in explaining other forms of causality between a negative shock in economic growth and negative shock in foreign direct investment, positive and negative shock in foreign direct investment to positive and negative shock in economic growth. In particular, we observed neutral asymmetric causalities running from positive and negative shock in foreign direct investment to positive and negative shock in economic growth.

Finally, inflation and economic growth causality exhibited from line 19 to line 24. We only observe symmetric causality running from economic growth to inflation (line 19). By contrast, in all other cases especially asymmetric casualty exhibits neutral relationship regardless of shock imposed either positive or negative shock in both variables.

Table 8 Asymmetric and non-asymmetric causality test

Null hypothesis	Test value	Critical value extracted with 10,000 bootstrap replications			Remarks
		1%	5%	10%	
Y ≠ FD (1)	26.689**	29.225	22.202	18.634	presence
Y^+≠ FD^+ (2)	18.598	37.364	28.385	23.823	
Y^-≠ FD^- (3)	10.442	27.851	21.158	17.758	
FD≠ Y (4)	36.223***	26.245	19.938	16.734	presence
FD^+≠ Y^+ (5)	41.284***	37.511	28.497	23.917	presence
FD^-≠ Y^-(6)	0.895	32.912	25.003	20.984	
Y≠ TO (7)	11.814	42.212	32.068	26.914	
Y^+≠ TO^+ (8)	11.731	33.319	25.312	21.244	
Y^-≠ TO^- (9)	3.495	30.722	23.339	19.588	
TO≠ Y(10)	41.538***	33.783	25.665	21.540	presence
TO^+≠ Y^+ (11)	34.556**	37.592	28.558	23.969	
TO^-≠ Y^- (12)	9.748	32.229	24.484	20.549	
Y≠ FDI (13)	11.183	34.088	25.896	21.734	
Y^+≠ FDI^+ (14)	29.602**	35.440	26.923	22.596	presence
Y^-≠ FDI^- (15)	0.221	34.556	26.252	22.033	
FDI≠ Y (16)	39.597***	30.840	23.428	19.663	presence
FDI^+≠ Y^+ (17)	6.273	33.356	25.340	21.267	
FDI^-≠ Y^- (18)	0.095	24.730	18.787	15.767	
Y≠ INF (19)	18.884**	29.239	22.212	18.642	presence
Y^+≠ INF^+(20)	21.88	36.048	27.385	22.984	
Y^-≠ INF^- (21)	0.429	33.039	25.099	21.066	
INF≠ Y (22)	18.550	38.6323	29.348	24.631	
INF^+≠ Y^+ (23)	11.791	34.427	26.154	21.950	
INF^-≠ Y^- (24)	1.968	30.316	23.030	19.329	

Note: A ≠B specifies, A does not cause B.

V. Conclusion and Policy Implications

The aim of this study to re-visit the nexus between financial development, trade openness, foreign direct investment, inflation, and economic growth of Bangladesh by applying nonlinear test for the period of 1975 to 2017. Econometrical methodologies applied in the study including, ARDL bound testing approach proposed by Pesaran et al. (2001b), nonlinear ARDL proposed by Shin et al. (2014) and Asymmetry causality test proposed by Hatemi-j (2012). ARDL bound testing approach to confirm long-run cointegration between financial development, trade openness, foreign direct investment, inflation and economic growth of Bangladesh of spanning from 1975-2017. Study findings also unveiled that in the long term the elasticity of financial development, trade openness, foreign direct investment are positively induced economic growth of Bangladesh and all the coefficients are statistically significant at a 1% level of significance. Therefore, we can conclude that further development, according to ARDL long-term model estimation, in the key macroeconomic variables will augment the economic growth of Bangladesh in a positive way. On the other hand, the effect of inflation on economic growth is negative and statistically significant at a 1% level of significance, which is expected in accordance with existing literature.

Furthermore, findings from nonlinear ARDL test also confirms there existence of long-run cointegration. In regards to the long run and short run asymmetry (see, *Table 6*), study findings established asymmetry effects running from financial development, trade openness, foreign direct investment and inflation to economic growth both in long run and in short run. Asymmetric effects in the long run (see, *Table 7*) we observed that both positive and negative shock in financial development (FD^{+}; FD^{-}) positively linked with th economic growth of Bangladesh. This findings suggesting that any further changes in financial development economy will experience positive imputes if positive changes happened, on the other hand, economic growth can be hampered with negative changes in financial development. It is consistent with financial development-led economic

growth hypothesis, which is also supported in empirical literatures see (). Addressing asymmetry effects from trade openness, we observed that both positive and negative shocks ($TO^{+}; TO^{-}$) negatively linked to the economic growth of Bangladesh. The positive shocks in trade openness can jeopardized current economic growth, the possible cause can be identified that is economy imports is significantly higher and more specifically imports goods heavily concentrated on consumer goods. Therefore, industrialization and aggregate production effects ignored that is why in the long run possible adverse effects might Bangladesh economy observed. On the other hand, negative shocks, implying contraction in international trade can boost economic growth. This finding explained that import dependency reduction would augment domestic production and eventually accelerates economic growth with higher aggregate production at large. The long run asymmetric coefficients of positive shocks in foreign direct investment (FDI^{+}) positively associated with economic growth, implying that the future positive trend in FDI will results in higher economic growth in Bangladesh. This finding suggests that inflows of FDI emerge as one of the long-term source of capital, which contributes substantially in infrastructural development, industrialization and capital adequacy. On the other hand, we observed that negative shocks in foreign direct investment (FDI^{-}) negatively linked to economic growth, though the restriction on FDI inflows can boost economic growth but the elasticity is insignificant.

Furthermore, asymmetry causality investigates by applying Hatemi-j (2012) between financial development, trade openness, foreign direct investment, inflation, and economic growth. Study finding unveiled unidirectional asymmetry causality running from positive shock in financial development to positive shock in economic growth, Study findings explained that further financial development would foster economic growth with a positive note. The possible explanation can be derived from positive shocks nexus positive economic growth that is easy access to financial service allows maximization economic resources with credit availability in the economy. It is because

financial expansion extends credit possibility by allowing capital adequacy. Another unidirectional causality we observed that is positive shocks in economic growth to positive shocks in foreign direct investment. This finding established the fact that is foreign investors is keen to transfer their valuable assets in the form of investment in those promising economy who are showing positive development in the long term.

With a concluding note by undertaking study findings, for accelerating and boosting the economic growth of Bangladesh the following policy suggestions we are proposing. First, the government should follow the monetary expansion policy to ensure continuous and sustainable financial sector development. Second, the government should undertake necessary actions to develop a conducive investment atmosphere for attracting foreign investment in the economy so that the contribution from FDI to economic growth may not hamper in the long term. Third, the effective implementation of trade policy focusing domestic trade expansion should be initiated through tread internationalization. Finally, control fiscal policy of maintaining stable inflation in the economy.

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