ORIGINAL ARTICLE

Impact of external public debt on economic growth: A case study of Bangladesh

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ABSTRACT

Purpose: The association between foreign (external) public debt and the economic growth has been studied extensively, with some studies showing a positive, others a negative relationship, and still others finding no significant relationship under any economic state. We choose this research with the aim to look at how Bangladesh's foreign state debt affects economic growth. **Materials and Methods:** This research uses gross domestic product growth (proxy variable of economic growth) as the response (dependent) variable and foreign direct investment (FDI) inflow, export, import, and external debt as the independent variables utilizing time series data for the years 1961–2021. This study uses secondary data sources like World Bank macrotrends data for all econometric analysis. We employ the econometric technique of Augmented Dickey Fuller and Phillips Perron unit root test to check stationary property of dependent and independent variables, autoregressive distributed lag (ARDL) bound testing approach to show the long run association, and ECM for short run association. **Results:** Findings of this study reveal that Foreign (external) debt adversely affect economic growth, that is, if foreign public debt is increase in 1%, it decreases economic growth by 8.81% in the short-run. Moreover, ARDL bound testing approach indicates that there is a long-term association between foreign public debt and economic growth. Long-run results also indicate if external public debt is increased in 1%, it will result in a 2.60% decline growth. Moreover, the findings of the research also demonstrate that import, export, and FDI inflow possess an insignificant impact on growth. **Implication:** Academicians and researchers can use the findings of this study as reference. In addition, it also helps the policymakers to manage foreign public debt, focus on debt sustainability, diversify funding sources, strengthen fiscal management, etc.

Key words: Autoregressive distributed lag bound testing, econometric impact, economic growth, external public debt

INTRODUCTION

The word "Public debt" is the sum of money owed by the country to creditors. These creditors are institutions, government agencies, and bodies either residents or nonresidents. It can be divided as domestic debts and foreign (external) debts. Domestic debts refer to obligations own to citizens of nation and its main sources are central bank; commercial banks; and Non-Bank Financial Institutions. On the other hand, external debts are received mainly from, International Development Association, Asian Development Bank, International

Monetary Fund, and Japan International Cooperation Agency (Saifuddin, 2016).

International Monetary Fund explained the term "Gross external debt" as "the sum of all distributed and unpaid legal responsibilities of citizens to foreigners for the repayment of principal regardless of interests or the payment of interests regardless of principal at any particular moment" (Ahamad and Islam, 2020). Any economy's external debt is thought of as one of the prime sources of funding. Moreover, it is deemed to be an essential and effective monetary tool of an economy if used appropriately in investment and development (Ahamad and Islam, 2020).

Whether external public debt promotes or inhabits economic growth is a contentious issue. In different economic conditions around the world, some scholars found a significant positive association between foreign (external) public debt and economic development (Mohamed, 2018) others found a negative relationship (Saungweme and Odhiambo, 2021; Madhuhansi and Shantha, 2021; Lim and Groschek, 2021), while yet others found none at all (Shah and Pervin, 2012).

The study's main focus is to measure the impact of external (foreign) public debt on economic growth in Bangladesh.

Research Justification

It is evidenced from the literature review that globally many researchers together with Babu et al. (2014), Rauf and Khan (2017), Rais and Anwar (2012), Malik et al. (2010), Hamid and Quddus (2010), Saungweme and Odhiambo (2021), Madhuhansi and Shantha (2021), Lim and Groschek (2021), Yusuf and Said (2018) Mohamed (2018), etc. conducted research to measure the effect of foreign debt on economic development (growth). Except for Mohamed (2018), all of the aforementioned scholars found strong adverse association between foreign (external) debt and economic development. Moreover, a small number of researches have also been done in Bangladesh with the same topic such as Yeasmin et al. (2015), Ahamad and Islam (2020), Farhana and Chowdhury (2014), Hassan and Akhter (2012), Rahman et al. (2012) and Saifuddin (2016). However, among the Bangladeshi researchers Yeasmin et al. (2015), Ahamad and Islam (2020), Farhana and Chowdhury (2014), Hassan and Akhter (2012) found a strong adverse impact of foreign debt on economic development in Bangladesh. However, Rahman et al. (2012), Shah and Pervin (2012), and Saifuddin (2016) have found a positive impact. However, Rahman et al. (2012) and Saifuddin (2016) used gross domestic product (GDP) as dependent variable and External debt as independent variable. Moreover, Farhana and Chowdhury (2014) and Yeasmin et al. (2015) also used GDP as dependent variable but their independent variables were investment, employment, and external debt. On the other hand, Ahamad and Islam (2020) took GDP per capita as dependent variable and public debt, gross capital formation, population growth rate, tread openness, inflation, and debt service on external debt as independent variables. Hassan and Akhter (2012) chose total debt burden as a percentage of GDP as dependent variable and consumption, investment, tax revenue, subsidies, net export, reserve, and manufacturing as independent variables. Among Bangladeshi researchers, only Shah and Pervin (2012) applied GDP growth rate as dependent variable and labor, capital, and external debt as independent variables. Although this study uses dependent variable same as Shah and Pervin (2012), but their independent variables are different one. Hence, this study is chosen to show some experimental proof on how foreign public debt influence economic growth of Bangladesh.

Literature Review

Madhuhansi and Shantha (2021) examined effect of both the domestic and external debt on financial development in Sri Lanka for 1980–2019 using Jacqua Bera, augmented dickey fuller (ADF) tests, Engel-Ganger residual-based model, and ECM. They showed that both the domestic debt and external debt adversely affect the economic growth in Sri Lanka in the long run, but in the short run, external debt showed a stronger effect compare to domestic debts.

Lim and Groschek (2021) analyzed the role government borrowing on financial development in Switzerland for 1997–2016 applying autoregressive distributed lag (ARDL) model and found a statistically significant influence of public debt on financial development.

Saungweme and Odhiambo (2021) analyzed the comparative influence of both the domestic and external public debt on financial development in South Africa for 1970–2017 using ARDL technique and showed a statistically strong adverse effect of domestic and foreign government debts on financial development.

Ahamad and Islam (2020) used ARDL bound testing approach to cointegration to examine the impact of Bangladesh's public debt economic development (growth) from 1990 to 2017. They discovered an adverse association between government borrowing (public debt) and economic growth in both short- and long-run. Moreover, they came to

the conclusion that money obtained through government borrowing is not put to use in effective economic sectors.

Hamid and Quddus (2020) measured effect of government borrowing on financial development of SAARC countries for 1990–2018 applying various econometric techniques. They showed in their study that government borrowing (public debt) adversely affects the financial growth.

Yusuf and Said (2018) investigated the influence of government borrowing on financial development for 1970–2015 utilizing cointegration and VECM approach and they found an adverse association among public borrowing and financial development. On the other hand, in Turkey, Korkmaz (2015) conducted the same study for 2003–2014 applying VAR model and he found unidirectional causality of government borrowing on financial development. However, in Sudan Mohamed (2018) examined the impact of foreign borrowing on financial development for 1969–2015 using the ADT test and VECM and found a positive effect.

Rauf and Khan (2017) evaluated the influence of foreign loan on financial development of Pakistan for 1972–2013 applying ARDL bound testing approach and showed a significant negative impact on growth. On the other hand, Rais and Anwar (2012) and Malik et al. (2010) also did this study for 1972–2010 and 1972–2005, respectively, and found significant negative effect.

Hossain and Shirin (2016) tested the effect of debts on financial development of Bangladesh from 2000 to 2015 through applying Autoregressive Distributed Lag model and showed a long term association between financial development and borrowings. Moreover, the researchers showed bidirectional causality between public sector foreign loan and financial development.

Saifuddin (2016) conducted a research study to investigate the effect of government borrowing on economic development of Bangladesh for the year 1974–2014 applying investment model and growth model theories with Augmented Dickey-Fuller Unit Root Test technique and showed indirect positive effect on growth.

Yeasmin et al. (2015) investigated the effect of foreign public debt on growth of GDPs in Bangladesh through time series data analysis technique covering the years 1972–2012 and found a strong adverse effect of external borrowing on growth.

Babu et al. (2014) assessed the impact of foreign debt on financial development (economic growth) in the East Africa community applying a fixed-effects model for 1970–2010 and showed a negatively significant impact on growth.

Farhana and Chowdhury (2014) studied the effect of foreign borrowing on financial development in Bangladesh covering the years 1972–2010 using Autoregressive Distributed Lag model and found a strong adverse impact of external borrowing on financial development in Bangladesh.

Shah and Pervin (2012) carried out a research to show the relationship between foreign government borrowing and financial development of Bangladesh from 1974 to 2010 and the researchers found a strong positive impact of foreign government borrowing on GDP growth in the long run.

Rahman et al. (2012) evaluated the connection among external loan and GDP in Bangladesh for 1972–2010 and showed a significant positive association among study variables.

Hassan and Akhter (2012) analyzed the effect of government debt burden on financial development in Bangladesh covering a period of 1980-81–2011-12 and they did not find any adverse effect of government debt on GDP growth.

MATERIALS AND METHODS

Data

This research is carried out based on a secondary data span covering 1961–2021. The main source of data is the World Bank macrotrends data indicator 2023. (https://www.macrotrends.net/countries/BGD/bangladesh/external-debt-stock).

Variables

The study used GDP growth (GDP) rate as response (Dependent) variable and Export, Import, foreign direct investment (FDI) inflow and External Debt as explanatory (Independent) variables. To make the data series similar, independent variables are taken as a percentage of GDP.

Methodology

The application of ARDL technique is ideally suited and efficient technique to observe the empirical association between dependent and independent variables. Moreover, the ARDL system means a single rigorous type of formula regardless of whether the repressors must be a combination of level, $I(0)$ and first difference, $I(1)$ or solely $I(0)$ or

solely $I(1)$. However, ARDL technique must be free of $I(2)$ property of variables to avoid spurious results (Sultanuzzaman et al., 2018).

This research used ARDL model to fulfill the main purpose of the study. The following empirical model is designed to examine how foreign (external) debt influence economic growth of Bangladesh:

$$GDPG_t = \beta_0 + \beta_1 FDI_t + \beta_2 Exp_t + \beta_3 Imp_t + \beta_4 Edebt_t + e`_t.$$

Where, t is the time series from 1961 to 2021, β_0 is the model constant, $\beta_1, \beta_2, \beta_3,$ and β_4 are the coefficients of the model, and e` is model error.

For this study, at first, the researchers checked the Multicollinearity of independent variables. Second, they conducted ADF and Phillips Perron (PP) test to verify the stationary properties of response and explanatory variables. In the third step, the best Lag duration for the model employing unrestricted VAR is checked using a lag length. Fourth, the study ran run ARDL model to the presence of cointegration. After getting the ARDL model result, the study made investigation for the short-term association in the fifth step and long-term relationship in the sixth step. Finally, stability test is done.

Application of Software

This study used EVEWS 12 student version for all test and analysis.

RESULTS AND DISCUSSION

Stationary (Unit Root) Property of Variables

This study used ADF test by EVIEWS 12 student version to verify unit root of dependent and independent variables. The test procedure is shown:
H_0 = GDPG has unit root; H_1 = GDPG has no unit root.
H_0 = EDEBT has unit root; H_1 = EDEBT has no unit root.
H_0 = FDI inflow has unit root; H_1 = FDI inflow has no unit root.
H_0 = IMP has unit root; H_1 = IMP has no unit root.
H_0 = EXP has unit root; H_0 = EXP has no unit root.

To observe the stationary property of GDP growth rate, export, import, FDI inflow, and external debt, we use ADF and PP unit root tests based on AIC with trend and constant. To run ARDL model, all variables must be stationary in level,

$I(0)$ and first difference, $I(1)$ or solely $I(0)$ or solely $I(1)$. However, if stationary property of variables shows degree of mixing order, it requires to use ARDL bound testing approach to examine the long-term association between the variables (Sultanuzzaman, 2018). ADF unit root tests results are shown in Table 1. It is observed from Table 1 that GDPG and EDEBT are stationary at $I(0)$ and export, import, and FDI inflows are stationary at $I(1)$ as the calculated t-statistic of that variables are larger than critical "t" at 95% confidence interval [Details are shown in Table 1]. Moreover, PP unit root tests results are shown in Table 2.

On the other hand, PP test results show that only GDPG is stationary at $I(0)$ and EDEBT, export, import, and FDI inflows are stationary at $I(1)$ as the calculated t-statistic of that variables are larger than crit. "t" at 95% confidence level [For details Table 2].

Optimal Length of Lag Selection Test

We have tested the maximum lag length of the model through VAR (vector autoregression) lag order selection criteria. Table 3 is showing the results of this test. It reveals that tested the maximum lag length of the model is "2," chosen based on the minimum value of each criterion, including FPE (Final Prediction Error), and AIC (Akaike Information Criterion).

Multicollinearity Test

We perform VIF test by applying EVews 12 Student version to detect Multicollinearity among various independent variables of the study. Cutoff value of VIF is 10 (Ullah et al., 2020). It is found from Table 4 that centered VIF of each individual variable is about 5 which is less than cutoff value 10. Hence, independent variables are free from multicollinearity problem.

ARDL Bounds Testing Approach

Pesaran et al. originated the ARDL bounds testing approach in the year 2001. It is applicable for a time series data which are a mixture of $I(0)$ and $I(1)$. Moreover, this test is applied to verify the presence of the long-run association among the response and explanatory variables. Decision rule of ARDL bounds testing approach is if estimated F-stat. falls outside lower bound, $I(0)$ and upper bound, $I(1)$ a conclusive inference can be drawn. However, if the estimated F-stat. falls inside lower bound, $I(0)$ and upper bound, $I(1)$, inference is inconclusive (Pesaran et al., 2001).

Table 1: ADF test results					
Var.	Calculated t-Stat. I (0)	Crit. "t" (5% sig. level)	Decisions	Calculated t-Statistic I (1)	Decisions
GDPG	6.24	3.48	H_0 accept	3.59	H_1 accept
EDEBT	4.54	3.48	H_0 accept	3.39	H_1 reject
FDI	1.83	3.48	H_0 reject	9.13	H_1 accept
EXP	1.73	3.48	H_0 reject	6.97	H_1 accept
IMP	2.98	3.48	H_0 reject	10.12	H_1 accept

Source: Authors own cal. FDI: Foreign direct investment, ADF: Augmented dickey fuller

Table 2: Phillips Person test estimation					
Variables	Calculated t-Statistic I (0)	Critical value of t at 5% sig. level	Decisions	Calculated t-Statistic I (1)	Decisions
GDPG	8.23	3.48	H_0 accept	33.94	H_1 accept
EDEBT	3.00	3.48	H_0 reject	13.49	H_1 reject
FDI	2.53	3.48	H_0 reject	9.16	H_1 accept
EXP	1.80	3.48	H_0 reject	6.97	H_1 accept
IMP	2.88	3.48	H_0 reject	10.26	H_1 accept

Source: Authors own cal. FDI: Foreign direct investment

Table 3: VAR lag order selection criteria					
Lag	Log L	Final Prediction Error	Akaike Info. Crit.	Schwarz Info. Crit.	Hannan-Quinn Info. Crit.
0	578.38	1.26e−15	−20.11874	−19.93953	−20.04909
1	723.79	1.85e−17	−24.34381	−23.26852*	−23.92592*
2	756.35	1.45e17*	−24.60881*	−22.63744	−23.84267
3	779.11	1.65e−17	−24.53024	−21.66280	−23.41586
4	801.72	1.99e−17	−24.44636	−20.68284	−22.98373

:*Indicates lag order selected by the criterion, Endogenous variables: GDPG EDEBT FDI IMP EXP, Exogenous: C, Sample: 1962–2021, Observations: 57

Table 4: VIF test results			
Variables	Coefficient variance	Un-centered VIF	Centered VIF
EDEBT	9.92E-05	1.283371	1.113719
FDI	3.446849	6.006032	4.116185
EXP	0.045974	30.44476	5.070736
IMP	0.040320	60.89207	4.620404

Source: Authors own calculation done by EVews 12 Student version

We used Evews 12 student version to run the ARDL bound testing approach based on the AIC (Akaike Information Criterion). The estimated results express that the calc. F-stat. is 20.57343, which is greater than lower bound $I(0)$ and upper bound $I(1)$ at 99, 97.50, 95, and 90% confidence interval. Hence, the study results [Table 5]

ensure the long-run association between the dependent and independent variables. Anticipated long-run parameters are presented in Table 6.

Long-run Relationship Results

Although coefficient of EDEBT and EXP is negative but EDEBT is significant at 1% level and EXP is statistically insignificant. It indicates that if EDEBT increases in 1%, GDP growth rate decreases in 2.60%.

On the other hand, FDI inflow and IMP coefficient are affirmative and statistically insignificant. These results indicate that EDEBT is one of the most crucial components for economic development of Bangladesh and it adversely affects Bangladesh`s economic growth [Details in Table 6].

Short-run Results of ARDL Model

Short-run analysis results are shown in Table 7. It indicates that D(EDEBT) is negative and statistically significant at 1% level. Moreover, if external public debt increases 1%, economic growth (GDP growth) decreases 8.81%. Hence, it is said that external public debt is the most important factors of economic growth in Bangladesh. In addition, study results also show that the sign of lagged error representation (Coint [Eq-1]) is negative and significant. It indicates the relationship between variables. The coefficient of Coint [Eq-1] is −2.005797 which indicates the speed of adjustment coefficient toward equilibrium. In addition, it also shows that adjustments are corrected by 200.57% from short-run to long-run of the time span over every year. On the other side, R squared value is 0.792225, which reflects that the dependent variable is explained in 79.22% differences by the independent variables. However, the Durbin-Watson statistic is 2.080930, which proves that there is no autocorrelation among the variables.

Test of Stability

To examine the ARDL model stability, this study conducts Cumulative Sum (CUSUM) test. CUSUM) test result is shown in Graph 1. Here, each blue line plots do not pass through the red line which indicates estimated model's stability.

Table 5: ARDL Bound testing estimation				
K	F-statistics	Sig. level (%)	Crit. $I(0)$ (lower bound)	Crit. I (1) (upper bound)
4	20.57343	10	3.03	4.06
		5	3.47	4.57
		2.5	3.89	5.07
		1	4.40	5.72

Response: D (GDPG); Observations: 59; H_0: No levels relationship

Table 6: Calculated long-run coefficients				
Variables	Coef.	S. Error	t-Statistics	Provability (p)-value
EDEBT	(0.026066)	0.004789	(5.442985)	0.0000*
EXP	(0.008635)	0.086941	(0.099325)	0.9213
FDI	0.101511	0.774875	0.131004	0.8963
IMP	0.104243	0.083833	1.243469	0.2195
Constant	0.031924	0.021587	1.478847	0.0145

EC=GDPG − (0.0262×EDEBT−0.0086×EXP+0.1015×FDI+0.1042×IMP), Dependent variable: GDPG, significant at *1% level, source: Authors own calculation by EVEWS 12 student version

Table 7: ECR (error correction regression), response var.: D (GDPG)				
Variables	Coeft.	S. Error	t-Stat.	Provability (p)-value
Constant	0.031924	0.007217	4.423648	0.0001
Trend	0.000996	0.000204	4.889786	0.0000
D (GDPG(−1))	0.349408	0.117458	2.974753	0.0045
D (EDEBT)	−0.088163	0.009752	−9.040481	0.0000
Coint (Eq-1)	−2.005797	0.190299	−10.54023	0.0000
R-Sq.	0.792225	Average response variable		0.000253
Adj. R-Sq.	0.776834	S. D. response variable		0.500734
S. E. of regression	0.023968	AIC		−4543291
SS resid	0.031020	S Crit.		−4.367229
Log likelihood	139.0271	HQ crit.		−4.474564
F-stat.	51.47404	D-W stat.		2.080930
Prob (F-stat.)	0.000000			
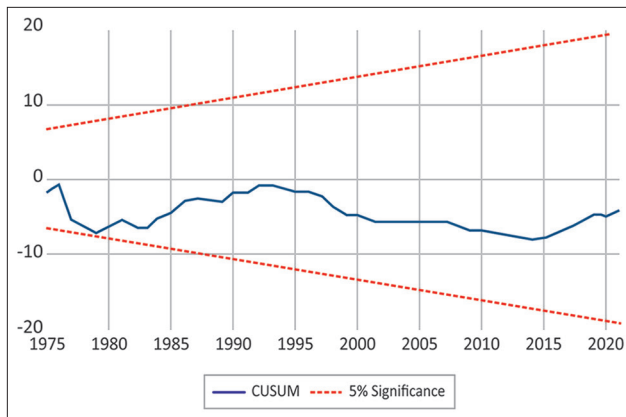
Graph 1: Cumulative sum test result

CONCLUSION

Recently our neighboring country, Sri Lanka is going through the worst economic depression in its history due to huge unsustainable external debt, severe balance of payment crisis, lack of export, etc. and many people are comparing Bangladesh with Sri Lanka.

Above situations inspired us to conduct a research regarding "How economic growth is affected by external public debt: A case study of Bangladesh."

We choose GDP growth as proxy variable of economic growth (dependent variable) and FDI inflows, export, import, and external debt as the independent variables. The study uses secondary data source- macrotrend for all econometric analysis. Moreover, we employ the econometric technique of ADF and PP unit root test to observe the stationary property of dependent and independent variables, ARDL bound testing approach to verify the long-term association, and ARDL ECM technique for short-term affiliation.

Study findings reveal that foreign (external) public debt has a statistically significant adverse impact on economic growth in the short run, that is, if external debt is increase in 1%, it decreases economic development by 8.81% in the short run. On the other hand, ARDL bound testing approach indicates a long-run association between foreign (external) public debt and economic growth. Long-run estimation display that if external public debt is increase in 1%, GDP growth rate decreases in 2.60%. However, study results also show that FDI inflows, export and import have statistically insignificant effect on economic growth.

AUTHOR'S CONTRIBUTION

This study is done by all authors mutually. At the beginning, data are collected by Mr. Faruk Hossain, AGM and then literature review part is completed by Mr. Mohammed Main Uddin, AGM and Mr. Md. Rezaul Karim, AGM. Finally, data analysis and report writing section of the study is carried out by Mr. Subrata Deb Nath, SPO.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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